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Per. G. A. Wilts 8° 62

Carrington 2

REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

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FOR THE

HALF-YEAR,

ENDING MIDSUMMER, 1865.

MARLBOROUGH:
PRINTED BY C. PERKINS, TIMES OFFICE.
1865.

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BIBLIOTHECA · BODL

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PREFACE.

The Editors feel it to be a duty which they owe to the School generally, to the Society, and to themselves, to prefix some brief explanation of the present undertaking.

It is now nearly a year and a half ago that a spontaneous movement arose among certain members of the School towards the pursuit of Natural History with some degree of system and organization. The desire thus existing soon became known to the Rev. T. A. Preston, whose neverfailing readiness to inform, to suggest, and to render invaluable help, cannot here be allowed to pass without the warmest acknowledgement. Under his eye a series of meetings have been held, which soon resulted in the formation of the "Marlborough College Natural History Society." Although membership has been limited to a very small number indeed, when the aggregate size of the School is considered, yet a sufficient quantity of interesting matter has accumulated through the Society's researches to justify (as the Editors venture to think) the present experiment.

A selection has been carefully made from the papers read at the meetings; and a full chronicle is furnished, conveying a fairly complete account of the general proceedings of the Society's members (and others) in the pursuit of Natural History.

The Editors claim the indulgence of the School, and of its many friends under whose eyes these pages may come, for what is, at best, no more than a first experiment. This experiment, however, has not been made without much consideration, nor without serious attention being paid to the remarks of those who doubt or deny the feasibility of carrying on a systematic work in Natural History at a school like Marlborough. Criticism from any quarter will be welcomed: friendly aid will be gratefully received. If, in consequence of what has here been attempted, the Society should be better understood, and its operations placed on a sounder basis, the best hopes of the Editors will have been realized.

LIST OF MEMBERS.

President—Rev. T. A. Preston.

Committee:

A. C. Almack.
W. W. Dayman.
G. K. Mills.
F. C. Lightfoot.
H. A. Evans.

Editing Committee:

W. W. Dayman.
A. C. Almack.
W. R. Carles.

R. F. Isaacson.
J. W. Whitaker.
J. Pole.
R. B. Mainwaring.
R. H. Brown.
H. A. Holland.
G. T. Spankie.
A. C. D. Ryder.
J. W. Parrington.
H. R. Parrington.
W. Koch.
L. G. D. Ryder.
H. Brackenbury.
P. S. Robinson.
A. Armstrong, Esq.
J. W. Harrison.
J. C. Richards.
R. H. Tyacke.
H. M. Moule, Esq.
P. Aldworth.

Hon. Members:

A. Marshall.
J. W. V. Taylor.
H. W. Hockin.

RULES.

1.—That this Society be called the Marlborough College Natural History Society.

2.—That it be managed by a Committe of Five Members, and that the vacancies in the Committee be filled up by persons elected from and by Members of the Society.

3.—That, in the absence of the President, one of the Committee take the Chair at the Meetings.

4.—That the Election of New Members rest with the Committee.

5.—That any one may be elected a Member of the Society, if he have attended as many meetings, and have shewn as much interest in the proceedings as the Committee shall think fit; and that the names of such New Members be read out at the next Meeting after the Election.

6.—That each Member be allowed to bring one Friend to the Meetings of the Society, and that this Friend be allowed and requested to enter into any discussion, or shew any object of interest, but be not allowed to vote on any question.

7.—That each Member be responsible for the behaviour of his Friend.

8.—That the Meetings of the Society be held once a fortnight.

9.—That the Committee be empowered to eject or suspend any Member, if, without good reason, he absent himself twice in succession from the Meetings of the Society, or be judged guilty of any serious misdemeanour at such Meetings.

10.—That any person present may exhibit objects calculated to interest the Society at their Meetings.

11.—That it be left to the Committee to determine the subjects for Lecture or discussion, and that any person may deliver a Lecture before the Society with the sanction of the Committee.

12.—That in case of an equality of votes, the casting vote lie with the President, and that he have no vote except in such a case.

13.—That a report of the proceedings of the Society be entered in a book, to be kept for that purpose by the Secretary.

14.—That the Secretary be chosen out of the Committee by the Members of the Society, and that he hold office for one half-year, but may offer himself for re-election at the commencement of the next.

15.—That any Member of the Society have power to bring forward a motion for the alteration of any Rule, provided his motion be seconded by another Member; and that the making of New Rules shall lie with the Committee, who shall not have power to alter them without the consent of the majority of the Society.

A. C. ALMACK,
HON. SEC.

February, 1865.

MEETING HELD FEBRUARY 17th, 1865.

This was the first meeting of the half-year, and there was a good attendance.

The exhibitions were as follows:—

A stuffed specimen of the black-throated diver, by G. K. Mills.

A piece of *brown* coal from Monmouthshire, by F. C. Lightfoot.

Illustrations of shells brought up in soundings of the Atlantic in 1856, by A. C. Almack.

Two Death's Head Moths and a Privet Hawk Moth, by J. W. Parrington.

A piece of Asbestos, by J. W. Mills.

A conglomeration of shells nearly six inches in length, found in making the Artesian well on Southampton Common, by A. C. Almack.

Coprolites from Bedfordshire, by J. W. Whitaker.

Mosaic from Constantinople, by J. W. Mills.

Peacock Ore, by J. W. Mills; also a piece of amber.

A small canoe, made by the Esquimaux from the teeth of the Walrus, by G. K. Mills.

And at the end of the meeting the Magnesium Light, by F. C. Lightfoot.

After the exhibitions an interesting paper was read by F. C. Lightfoot,

ON THE ANATOMY OF THE HONEY BEE.

The Honey Bee is of the order *Hymenoptera*, *i.e.*, it is furnished with membranous wings, which, in its case, are four in number. Its anatomic structure, even to the superficial observer, presents evidence of the design of the Creator, and of the admirable adaptation of the parts to their several uses. The body is about half-an-inch long, of a blackish brown colour, which deepens with age, and is covered with hairs which greatly assist the insect in collecting the farina of flowers. Tearing open the flower on which it alights, it rolls its body about in the corolla, and the hair brushes off the farina, which the bee moistens either with its mouth, or, if in the morning, with dew, and moulds into pellets, which are passed from one pair of legs to another till they are lodged in a spoon-like cavity in the thigh. The head is triangular and flattened; it is furnished with a pair of large eyes, consisting of a number of hexagonal facets, each being a complete eye in itself. They are covered with close-set hairs, which act the part of eyelids to keep the dust from the eyes when the bees are collecting the farina. The bee has also three *ocelli* or simple eyes, placed in the form of a triangle in the crown of the head, but not visible except under a microscope. The *antennæ* are two tubes about the thickness of a human hair, and spring from between the eyes, a little below the *ocelli*. They are jointed throughout, each consisting of twelve articulations. Their extremities are tipped with very sensitive small round knobs; and as these knobs are very like the *ocelli*, they might be supposed to serve the office of sight, but more probably they serve that of touch. The bee also uses them to recognize the bees of its own hive, for a stranger is never allowed in a foreign hive.

The different organs of the mouth are the *tongue*, the *mandibles* (upper jaws), *maxillæ* (lower jaws), *labrum* (upper lip), *labium* (lower lip), the *proboscis*, connected with the *labium*, and four *feelers*. The tongue is within the mouth, and is so small as not to be easily seen. The upper and lower jaws are divided vertically, the teeth being on the upper jaw, while the lower, with the *labium*, help to form the proboscis. This latter organ is used by the bee to extract juices from the nectaries of flowers, and consists principally of a long slender projection called the *ligula*. It is a prolongation of the lower lip, not tubular, but solid, composed of a number of horny rings, covered with minute hairs, and having a tuft of hair at the end. It is flat, of the thickness of a human hair, and, from being composed of rings, is capable of movement in all directions.

It is probable, as Huber says, that by muscular motion the fluids which it laps are propelled into the *pharynx* or canal situated at the root of the organ, through which it is conveyed to the honey bag. From the base of this lapping instrument arise the *labial palpi*, or feelers (composed of four articulations of unequal length, that nearest the head being much the largest), whose peculiar office is to ascertain the nature of the insect's food. Both these and the *ligula* are protected by the *maxillæ*, which envelop them when at rest, as if between two half-sheaths, and thus present the appearance of a single tube. About the middle of the *maxillæ* are situated the maxillary *palpi*, which are very small, but which play the same part as the *palpi* at the bottom of the *ligula*. The whole of this instrument is capable of being doubled up by means of an hinge in the middle. The *trunk* or *thorax* approaches in form to a sphere, and is united to the head by a thread-like ligament. It contains the muscles of the wings and legs; the wings consist of two pairs of unequal size, and are joined to each other by slender hooks. Behind the wing on each side of the trunk are two small orifices, called *stigmata* or *spiraclee*. These orifices are connected with a series of air tubes, extending to every part of the body, and serving the purpose of lungs.

To the under part of the trunk are attached three pairs of legs, the anterior pair being the shortest; the posterior pair being the longest. In each of these are several joints, three of which are longer than the others, serving to connect the thigh, the leg, and the foot; the others being situated chiefly in the foot. In the thigh of each hind leg is a cavity, possessed by neither queens or drones, and used for carrying the pollen of flowers to the hive, pollen being one of the ingredients of the food of young bees; whereas the inner surface of the cavity is lined with strong close-set hairs. These cavities are also baskets, in which the *propolis*, a gummy substance, is carried home and employed by the bees in fastening the combs to the top of the hives, and in filling up any holes by which cold or wet might be let in. The junction of the leg and foot is such as to form a pair of pincers. Each of the six feet terminate in two hooks, with the points opposed to each other, by which the bees cling to the roof of the hives, and to one another when clustered together as in swarming, or in hanging in festoons. From the middle of these hooks proceeds a thin appendage, which enables the bee to walk securely on glass and other slippery surfaces with its feet upwards. The *abdomen*, attached to the posterior part of the thorax by a slender ligament, like that which unites the thorax and head, consists of six scaly rings of unequal breadth. It contains two stomachs, the small intestines, the venom-bag, and sting. There is an opening at the root of the proboscis, which is the mouth of the *œsophagus* or gullet, which traverses the trunk that leads to the anterior stomach. This is but an expansion of the gullet, and forms the honey bag. The second stomach, which is separated from the first, is cylindrical and muscular. It is the receptacle of the food, which is there digested and conveyed to all parts of the body for its nutriment. It also receives honey, from which wax is formed, scales of this being found ranged in pairs, in small receptacles under the abdomen. The sting, with its appendages, is close to the last stomach, and seems to the naked eye a very simple instrument, but is, in reality, like the proboscis, a very complicated one. It is composed of two darts placed side by side, and lodged in one sheath, one dart being longer than the other. When the bee uses its sting, one of the darts is first thrust into the victim, and when this dart has taken hold of the flesh, the other is inserted. The sheath consists of two horny scales, themselves enclosed within two fleshy ones, and along the groove formed by these the poison flows from a bag placed at the root of the sting. The sting is barbed like an arrow, the barbs being five in number on each dart, consequently, when the bee uses its sting, it leaves it in the wound, and very often some of the intestines with it, thereby causing its death.

The *Queen*, in appearance, differs from the workers in these respects. Her body is larger, of a deep black on the surface, her abdomen being of a rich tawny colour; her legs are longer, but are without the hairy brushes at the joints, and are destitute of the cavity in the thigh.

The *Male* or *Drone* is much more bulky than the worker; his eyes are more prominent, the antennæ have thirteen articulations instead of twelve, the proboscis is shorter, the hind legs want the spoon-like cavity in the thigh, and he has no sting.

After the paper, the Secretary read out and distributed lists of the rules; after which, according to rule 15, he resigned his office of Secretary, which he had held for the last half-year, but was almost unanimously re-elected.

A private Meeting of the Society was then held.

MEETING HELD MARCH 3rd, 1865

The exhibitions were the following:—

Photographs of the remains of the New Zealand Moa, by Mr. Preston, who made some remarks on its size, &c.

Some Nutmegs, by J. W. Mills.

A box of Butterflies and Beetles, by R. H. Brown.

Some real and unreal Nutmegs, by Mr. Preston.

A piece of fossilized Horn, by J. W. Mills.

Photographs of a hanging wasp's nest, by H. A. Evans.

A. C. Almack then read the following paper, after which he showed a specimen of the Honey Buzzard's egg, which he believed to be English, but as it had been left to him in a collection without any account, he could not say for certain:—

ON EGGS.

The subject that I have chosen for my paper will, I hope, be interesting to the Entomologist, as well as the Ornithologist, since all eggs are formed in precisely the same manner. Indeed, there is no real difference, except in size, between the egg of an eagle and the egg of a moth; between that of an ostrich and that of a fish. It is my intention to speak more particularly to-night about the eggs of the feathered tribes, which, from their numerous varieties of colour and size, have always been objects of so much interest to the school-boy. And, in speaking of size, it may perhaps not be out of place to mention that the fossil remains of an egg of the Epyornis have been found in Madagascar, large enough to contain about seventeen English pints; that is equal to six ostrich's, or one-hundred-and-forty-eight of our common hen's eggs.

Taking an egg, and beginning with the outside, we have first the shell, which is formed of carbonate of lime, secreted from the food by peculiar organs provided for the purpose. It has been discovered that the shell is colourless in the case of every bird till a short time before it is laid; but how and why the colour is then received, still remains a mystery. A very short time suffices to harden the shell, but eggs are not uncommonly laid with soft shells, showing either a deficiency of material, or else of secreting power in the parent bird. Next to the shell is a membrane, known as the *membrana putaminis*, which, on close examination, will be found to consist of two skins, which fit compactly together in every part, except at the larger end, where they separate, the inner one being the smaller of the two, and the outer one still adhering closely to the shell. A kind of diminutive bladder is thus formed, containing the air necessary for the young bird during the time that it is enclosed in the shell, and exhibiting one of the most wonderful provisions of nature, presented to us by the examination of an egg. Enclosed in this membrane is the white fluid called by scientific men the *albumen*, which is said to be divided into two parts by a very thin skin, hard to see, and very difficult to comprehend. The *albumen* is, when chemically analyzed, found to consist of the same elements as the shell, viz., carbonate of lime, &c.; and also serves as a means of protection, gradually drying up into it as the embryo grows.

Next we come to the yolk, which also is enclosed in a thin skin, visible sometimes even to the naked eye, and which forms the food of the embryo while still in the shell. Thus in the egg we have found two of the three great necessaries of all production and existence,—protection, the shell and albumen; nutrition, the yolk; but where is the third, the germ of life or vital principle? It is in a small spot that is hardly visible to the naked eye in the centre of the yolk. To understand this vital principle is utterly impossible; all we know is that it is given to this mere atom in the centre when the task of incubation is begun by the parent bird, and that it is taken away when the bird dies.

In order to explain, as well as I am able, the process of hatching, it will be necessary to follow the growth of the embryo till it bursts the shell. After the mother has been sitting on the egg for twelve hours, a distinct change is perceptible in the spot in the centre of the yolk; it has become rather oblong instead of round, and the outline has a jagged instead of a smooth appearance. Four hours later, a still greater change is perceptible, the embryo being much larger, and exhibiting a somewhat broken line, marked down the centre. If examined with a microscope about thirty-six hours after incubation has begun, it will exhibit a peculiar appearance, something like a caterpillar, with veins branching out in every direction; and on the fourth day the eyes become visible, being large projecting objects with rings round them. A sort of snout or muzzle is also formed by this time. In this state the head appears to be very much too large for the body, and the eyes for the head*.

While all these changes have been going on in the chick itself, the whole egg has been also changed; the yolk is thickly sewn with red veins, and can hardly be distinguished from the creature itself, to which it affords nourishment probably through these veins. Larger and larger the creature grows, and at the end of the tenth day the wings, feet, and tail may be clearly seen. At last it fills the whole space within the shell, and has to be doubled up in a most extraordinary manner, with the head and feet together, and the bill close to the shell, ready to be at work upon it the moment the right time arrives. It is, in all probability, an erroneous idea to suppose that the parent bird chips the shell, for when we consider that the skin, through which a way must first be made, is stretched to the utmost extent, and that the shell must be weakened very much from the great pressure within, it does not appear such a hard task for the chick to break it, especially when the little creature is often provided with a hard horny tip to the bill; and besides, the bill is so placed that the slightest movement of it must necessarily bring it in contact with the skin and shell. All eggs require warmth alone to bring to life the vital principle within them, and hatch the young chick; those of fish and insects being influenced by it in precisely the same manner as those of birds, though the warmth is obtained in a totally different manner: in the case of birds from the mother, and in that of fish from the sun.

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* Illustrations of these changes may be seen in one of the "Nests and Eggs' Series" of the Young Naturalist's Library, from which book this account is almost entirely taken.

I will now pass on to say a few words about the size of eggs, which vary so much in proportion to the size of the creature by which they are produced. As a rule, it will be found that when produced in great numbers, they are small in proportion to the size of the parent, and vice versâ. Among birds this disproportion is very frequent, and it may, perhaps, be as well to give a few of the most remarkable instances.—The Guillemot is only seventeen inches in length, and twenty-five in breadth, according to Bewick; and the Raven is more than two feet long and four broad, and yet the egg of the Guillemot is more than six times the size of the latter. Again, the Black-backed Gull, which is about the same length as the Raven, but about a foot broader, lays an egg four times as large; and the Lapwing, which is only thirteen inches in length, lays an egg twice as large as the Crow, which is eighteen inches. But in these instances the number of eggs laid is small, when the size is large in proportion to the bird; the Guillemot being a very remarkable instance, since it never lays more than one egg. It is also curious that almost invariably the birds that lay large eggs are water birds; and those that lay small, land birds. Such is the provision of nature, which it is impossible for us to explain satisfactorily.

Before I bring these few remarks to a close, I will mention a curious theory I came across in Montague's Ornithological Dictionary, respecting the colour of bird's eggs. It was a theory advanced some time ago by a German naturalist, trying to prove that the reason eggs were coloured was that they might more easily escape notice, a theory as ingenious as it is absurd, for it breaks down in more cases than it holds good. The case of rooks, magpies, and birds of that kind, is taken as an example; and it is said that they all lay eggs of a bluish colour, so that they are invisible when seen through the nest against the blue sky above, without it being remembered that the sky is not always blue, or the nest always transparent; or that if such were the case, pigeons would always lay blue eggs. When proving the theory, with respect to those that build on the ground, he is much more successful, and probably right, as the eggs generally resemble the colour of the grass or soil around. Where they are so easy of access to man and beast, as on the ground, it seems but reasonable that their colour should be given them for protection; but where they are so difficult of access as the tops of tall trees, it is hard to assign any reason at all for their colouring. One thing only is certain, viz., that where there are more than one female to one male, the egg is white.

MEETING HELD MARCH 17th, 1865.

EXHIBITIONS:—

Some fossilized Wood from Hastings, by R. H. Brown.

A box of scarlet tiger moths, by the Rev. T. A. Preston.

Articles (model canoe, &c.) made by the Esquimaux, by G. K. Mills.

Bag made from bark of the birch, by J. W. Mills.

Some owl-pellets, by A. C. Almack.

A rat-tailed maggot, by the Rev. T. A. Preston.

A large shell from the chalk, by A. C. Almack.

" Æruginosa pezisa," on oak wood from the Forest, by Rev. T. A. Preston.

F. C. Lightfoot then read a paper on " Bees in the Hive," making his second on that interesting subject.

MEETING HELD MARCH 31st, 1865.

EXHIBITIONS:—

A box of Swiss Butterflies, collected by Rev. J. Sowerby, by F. C. Lightfoot.

Some Roman bones, by F. C. Lightfoot.

A root of grass which had pierced that of a crocus, by Rev. T. A. Preston.

Some Moths, by H. A. Evans.

An African Cockchafer, by H. Brackenbury.

The following short paper was then read by W. W. Dayman,

ON SPIDERS.

EVERYONE knows the Spider, the subject of my lecture. Yet few, I fancy, feel any interest in these insects, on account of their repulsive appearance, and apparently ferocious and blood-thirsty nature; yet they seem to me to have obtained this unpopularity rather unfairly, if we consider the immense amount of good that this large tribe does to mankind, in ridding us of the perfect pest of flies that reigns everywhere in the summer, and, in fact, almost throughout the whole year. On the other hand, the large tribe of the Lepidoptera, or Butterflies and Moths, especially the former, are looked on by many with positive liking; by all, or almost all, with admiration for their beauty; while their admirers entirely forget the fact that these insects, a short time before, were sightless grubs, devouring everything green, and foes to every gardener and husbandman.

With this short preface I will pass on. Spiders, are universal,—they may be found in every element except fire, on the earth, under the earth, on the water, beneath its surface, and even in the air itself, they may be seen either weaving their snares, or hunting their prey by sheer activity. Spiders do not belong to the strict order of Insecta, *i.e.*, they are insects so far as that they are distinct from beasts, birds, fishes, &c., but in the true sense of the word Spiders have no claim to be considered insects at all. I mean that their body is not cut into three distinct parts, which is the first essential quality of a member of the Insecta. Spiders have their head and thorax united, or indistinguishable, while on the other hand an ant or a wasp is clearly divided into three separate parts, and are therefore strictly insects. These three parts, it may be well to say, are called the *Head*, the *Thorax* or chest, and the *Abdomen* or stomach. Spiders have generally eight legs, of three joints each; eight eyes arranged irregularly in the front of the head (most usually in a rough semi-circle); a pair of *palpi* or feelers; and a pair of curved jaws. At the hinder end of the stomach are placed the spinners, consisting of five little tubercles, each of which emits a thread, and can be closed and opened at pleasure. These threads unite into one at a short distance from the mouths of the tubercles. When first emitted, the thread is merely a gluey substance, which hardens on exposure to the air. Each of these five tubercles has in it at least a thousand other little holes called *papillæ*, all of which emit separate threads, so that the whole thread consists of at least 5,000 distinct threads, and in many instances of more; and this is the case with the smallest Spiders. As a proof of the wonderful tenuity of a Spider's thread, I will quote a writer speaking of Leuwenhoek's Computations.—" The whole of the young Spider is perhaps less than a *papilla* of the parent which produced it. But there are even some kinds of Spiders so small at their birth that they are not visible without a microscope. There are usually found an infinity of these in a cluster, and they only appear like a number of red points; and yet there are webs found under them, although almost imperceptible. What must be the tenuity of one of these threads? Mr. Leuwenhoek has computed that one hundred of the single threads of a full-grown Spider are not equal to the diameter of a hair of his beard; and consequently, if the threads and hair be both round, ten thousand such threads are not larger than such a hair. He calculates farther, that when young Spiders first begin to spin, four hundred of them are not larger than one which is of a full growth; allowing which, four millions of young Spider's threads are not so large as the single hair of a man's beard."

This astonishing computation may be trusted as having been made by one of the most accurate and patient of naturalists, or you would be justified in rejecting it as an impossibility. The silk of the Spider is sometimes used in place of that of the silkworm, to make gloves, but is far inferior both in strength and lustre. Spiders frequently change their colour, which, in fact, always varies according to age, sex, season, &c.; and they are generally most beautifully coloured, and in the height of their vigour during the autumn, their longevity being greater than most insects.

I shall now proceed to speak of the Geometrical Spider, which spins the nets so often observed in gardens, &c , and its mode of doing so, but will first say a few words on the emission of the silk, which was long a great puzzle to entomologists. It has been found that the Spider, when wishing to emit a thread, turns its head to the wind and elevates its abdomen; it then emits the viscid thread, which is blown about by the wind till it reaches something to which it fastens itself, and the Spider then tightening the line, walks safely across the space. No line can be emitted except favoured by a current of air in that direction. To proceed, the Geometrical Spider casts a few of these lines across to some neighbouring flower or leaf in any direction, to act as the outside framework, and then one straight across from thread to thread, down which she passes, and taking up her station in the centre, throws another line at right angles to this to another outside cable, and continues this till the net assumes the shape of a wheel; she then walks round the spokes from the centre, drawing the threads after her, and keeping each circle free from the one before (on which she walks), by one of her hind legs, and, having finished the circular threads, she bites off the knot of silk in the centre of the thread where the spokes all meet, to give the net more elasticity, and either takes up her position there, or under some neighbouring leaf, to wait for her prey. The circular threads are covered with little drops of gum to make them viscid, for the purpose of entangling the insects, whereas the spokes, which serve merely as the framework of the net, have no viscid power; but the manner of the Spider's spinning these two different kinds of threads is not yet known, but it is found that *all* the threads emitted from the spinnerets are ordinarily viscid, so that the Spider probably has some power of depriving these of gum.

The more remarkable kind of Spiders are the following, of each of which I propose to speak shortly :—

1.—THE TARANTULA, whose name most persons know, as well as the popular belief that the bite causes a sort of St. Vitus' dance, or irrepressible desire for violent motion, terminating in madness and convulsions.

2.—MYGALE AVICULARIA, described by M. Merian as eating birds, which story, however, was for a long time utterly disbelieved, till its truth was lately confirmed by Mr. Bates, in his visit to the Amazon. It spins a web of immense thickness across the hollows of trees, &c., behind which it takes up its station. This web is strong enough to entangle finches and small birds, which Mr. Bates found to be really the food of this monster, having observed one that had killed one finch, and was in the act of killing another.

Besides these two well-known species, there are Spiders of the common kind everywhere, and which construct snares of every description. One makes a *hat-box* of silk, the top opening with a hinge. Others make a tunnel, at the end of which they lie concealed. Another makes a very curious net *under the water*, which I will describe :—The Spider is furnished with a great number of hairs, which, when the insect plunges into the water, carry down a bubble of air in them. The Spider then, having previously spun a cap-like limp net between the weeds, descends beneath the cap and frees herself of the bubble, which instantly in its progress to the surface catches the cap and inflates it, till having carried down sufficient bubbles for the purpose, she takes up her home in the little airy chamber she has made, and looks out for water insects. Another kind makes a raft of weeds, and floats down the fen-ditches of Norfolk. When it perceives an insect struggling in the water, it leaves its raft to save it from a watery death (and reserve it for its larder). If disturbed in this humane (?) pursuit, it instantly dives under the raft. To another kind also belong the well-known Spiders that run on the water and

> "Bathe unwet their oily forms, and dwell
> With feet repulsive, on the dimpling well."

The Hunting Spiders may be observed on warm walls or fences, hunting flies by enormous springs, which they make with the greatest precision, coming down clear on the back of some unfortunate fly from about a foot's distance.

With these few descriptions of the more remarkable, or better known Genera of Araneœ, I will close my paper, hoping to have shewn you that in reality there are few insects more interesting, or more beneficial to man. I might, by recounting anecdotes of the Spider's activity and acute instinct, proceed to do so at much greater length; but I will refrain, in the hope that my hearers may be sufficiently interested to look at these facts for themselves.

MEETING HELD APRIL 7th, 1865.

After the usual reading of the names of visitors, the following objects were exhibited:—

A curiously expanded stick, found in Rabley Copse, by A. C. Almack.
A few minerals, by H. W. Hockin.
A piece of Roman pavement, by J. W. Mills.
A piece of fossilized wood from Portland, by J. Pole.
Matte Tea from Paraguay, by J. W. Mills.
Some empty cocoons of club-horned bees, by H. A. Evans.
The two first thrush's eggs of the year, by J. W. Parrington.

The Rev. T. A. Preston then read the following paper, accompanied by chemical experiments, on the subject of—

COTTON.

In treating of the subject of Cotton, I propose to divide it into three parts. (1)—An explanation of what Cotton is, and how it differs from other vegetable fibres used in commerce; (2) an examination of a few of its chemical qualities; and (3) a description of the plant from which it is obtained, and its various uses in commerce.

If we take the stem of a plant, as for instance a nettle, and bruise it with a smooth hammer, so as not to *cut* it, we shall obtain two distinct products; first, a pulpy mass; and secondly, a bundle of fibres, varying in thickness according to the plant upon which we operate. Now though these two products are apparently so different, they are yet composed of the very same material, which is merely altered in appearance according to the part of the plant which it forms; and, in fact, the whole structure of a plant, however much it varies in appearance, whether the stone of a cherry or the wood of a tree, is composed of the same substance as that which forms the cells of the stem, and is therefore called *cellulose*.

But though the two products which we have thus obtained from the nettle are composed of really the same material, they present very different aspects. The fibres, when examined under the microscope, are found to consist of long cells, tapering at each end, and joined together, not end to end, but so that the ends over-lap, and thus a very strong union between them is obtained; these cells, moreover, are very tough and elastic, and hence the fibres of plants are of very considerable strength, and when they can be obtained in sufficient quantities, are used for commercial purposes. Let us now examine the pulpy portion. This, too, consists of cells, which really form all the rest of the plant, being modified in shape, according to their position in its structure. Inside the plant they are loosely arranged, but when situated externally, they form a thin skin, covering the whole plant. In this skin are the breathing holes, and to it are fastened the hairs, bristles, prickles, and other similar appendages of the plant. In this way the skin of a plant resembles the skin of an animal, for hair, feathers, nails, &c., are merely modified parts of the skin. Upon examining the hair of a plant under the microscope, we shall observe that it, like the fibre, is composed of cells, but of a very much more delicate character; and that the cells (not being pointed at each end), are attached end to end to one another, and hence a hair is very much weaker than a fibre; in fact, as a rule, where hairs are sufficiently long to be used for forming a thread, they are so weak that they cannot stand the twisting and pulling necessary to be undergone in the process of manufacture.

Now as hairs are found not only on the skin of animals, but also, in some cases, inside their very bodies, so, too, do we find, though very rarely, hairs *inside* plants, viz., on the seed. And here it is that we find the Cotton of commerce; and what adds so much to its curiosity as a botanical production is, that it is the only vegetable hair which has yet been found in sufficient quantity, having qualities rendering it suitable for the purposes of manufacture.

But there is another interesting peculiarity of Cotton, which must not be passed over. In order to twist up a mass of fibre into a thread, these fibres must have some uneven surfaces, in order to prevent them from slipping; and if we examine silk, hair, wool, or any fibre used for cordage, we shall find that in one way or another, this unevenness is obtained. In *silk*, though the thread when spun is perfectly smooth, yet, when unwound from the cocoon, a large quantity of the gum, used for making the threads adhere to one another, is still left on the thread, and a very uneven surface is obtained. In animal *hairs* we shall find a most varied structure, no two hairs being similar, and *all*, even human hair, having projections from their surfaces. In vegetable fibres, if the fibre itself is not rough, it is rendered so by the fragments of the cellular tissue still adhering to it. How, then, is the unevenness obtained in the hairs of the Cotton plant, which especially adapts it for manufacturing purposes, for there are hairs of other plants which are quite as long and as strong as those of the Cotton, but, being perfectly smooth, are unfitted for weaving? When examining a hair of the Cotton plant under the microscope, we shall observe that it resembles a ribbon with a thickened edge on each side, and *twisted.* A Cotton hair, when quite young, consists of a hollow tube, perfectly round, which grows rapidly as it approaches maturity. The capsule in which the seeds are contained, does not grow sufficiently fast to allow these hairs to grow out straight, and they consequently get pressed against the sides of the capsule, so as to intertwine among one another. In this way they get flattened and twisted, and the hollow circular tubes in their full-grown state present the appearance mentioned above. Strange, then, though it may appear, yet it is not the less true, as observed by Dr. Lankester,—the staple manufacture of one of the greatest countries in the world, and the staple produce of another, depend upon the *apparently* (but only apparently) accidental twisting of a hair.

2. I now proceed to the second portion of my subject—its chemical qualities. I have said that plants are entirely made up of one substance, which forms the cells, and is therefore called cellulose. We obtain other products from plants, but they are merely secretions or *additions* to the plant, not essential parts of its structure. Now Cotton, when cleaned from external impurities, is one of the best sources of cellulose, and we can experiment upon Cotton when we wish to know the peculiar properties of cellulose.

Now the fact of cellulose being insoluble in either hot or cold water affords a good point of distinction between this product of the vegetable kingdom and *gelatine*, the corresponding product of the animal, which is soluble in hot water. This may seem a needless remark, but by the addition of sulphuric acid, Cotton is converted into starch, very similar in appearance to gelatine. That it is starch, is known by the effect of iodine upon it, turning it to a fine blue. If the acid is allowed to act still longer upon the cotton, it is converted from starch into a product called dextrine, and afterwards into grape sugar. It undergoes the same changes as the starch stored up in potatoes and seeds. When potatoes are allowed to germinate, and then cooked for the table, they have a very unpleasant and rather sweetish taste, the reason being, that the starch is converted into grape sugar. In the case of cotton, this grape-sugar, by some processes, can even be obtained in a crystallized form.

A very interesting effect of sulphuric acid on Cotton is seen by immersing unsized paper (e.g. blotting paper) for a few seconds into a solution of ⅔ acid, and ⅓ water. The paper is at once converted into a substance like parchment in appearance, though none of its chemical qualities are altered.

But perhaps one of the most remarkable properties of Cotton is that which it assumes when immersed in strong nitric acid. Though unaltered in appearance, it is totally changed in every other particular. Its weight is increased *six times*, and when ignited burns more rapidly than gunpowder, leaves no ash, and generates such an enormous quantity of gas, that, if confined, it will burst the vessel in which it is contained long before it is all consumed. It is then, in fact, Gun-Cotton. It ignites at a temperature of 200° below that required to ignite gunpowder, and burns infinitely faster; so rapidly does it burn, that it is possible to consume a piece of gun-cotton on the hand without feeling much heat, or even on the top of gunpowder without igniting the powder. Its effects, too, when used for explosions, are three times as great as those produced by an equal quantity of gunpowder. Hence, until very recently, (its preparation is now conducted on a different plan) it was impossible to use it in gunnery, for its explosion was so sudden, that it would burst the gun. If impregnated with chlorate of potash, its explosive properties are still greater; two grains of Cotton so prepared, when fired off, have been known to shatter a pistol barrel to pieces. But even without this last preparation its effects, when exploded, are tremendous. A bottle of gun cotton was once immersed under the water in a well, to obtain an imitation of a submarine explosion, and, when fired off, the whole well was destroyed. Its preparation is now conducted so that it is capable of being used for gunnery purposes, and as its effects are unimpaired if used in a dry state, however much it may have been previously damped, it is more serviceable than gunpowder. One very curious fact about gun-cotton is, that though burning so rapidly, yet, if a lighted fusee made of gun-cotton, be pressed lightly for a moment, so as to check its burning, it will still continue to burn slowly, though the pressure be removed the moment the flame has been checked.

But we have not yet finished with this part of the subject.—Though insoluble in water or alcohol, it is soluble in ether. If gun-cotton be immersed in a mixture of (7 pts. of) ether, and (1 of) alcohol, it will be dissolved; the resulting liquid, when dried in small quantities on a glass plate, leaves a very thin transparent film. The liquid thus obtained goes by the name of *collodion*, so extensively used in surgery and photography.

Before leaving this part of the subject, I must refer to the process of *dyeing* Cotton. Vegetable fabrics receive different impressions from the colouring substances with which they are dyed. Cotton, hemp, and jute, when exposed to the same dyeing agents, do not present the same colours; and these again are very different from the colours received by animal substances. In the case of cotton, the dye is not spread over the wall of the cell, but is received into its interior.

A very curious fact in connection with this was discovered by Mr. Mercer. If cotton be steeped in a solution of caustic soda, the hairs swell out into their proper hollow tubes, and the chemical qualities are so altered that the hairs receive much brighter colours, and more readily, though the strength of the fibre is unaltered. Hence, in making cotton stockings, they make them very loose, and then immerse them in the solution; this contracts their dimensions very much, and makes them assume a more elegant form; they are also rendered more susceptible to the influence of the dyes.

3. The Cotton, as I have said, grows upon the *seed* of the Cotton plant. There are many kinds of cotton, though from cultivation the number is often made

larger than we have any reason to suppose. There are probably not more than four or five distinct kinds. The plant, as most commonly cultivated, is a very showy one, with fine yellow flowers, having a red spot at the base of each petal. They are shaped like a mallow or hollyhock, the petals being rather more delicate. A great peculiarity about the flower (which is one of the characteristics of the mallow tribe, to which this plant belongs), is that in the bud the petals are all twisted, just as if some one had given the flower a twist as soon as formed in the bud. The stamens are also united into a bundle by their filaments, leaving all the anthers free. The hairs on the seeds, and three bracts at the base of the flower serve to distinguish the genus gossypium (cotton plant) from the others of the order.

The plant itself, when cultivated, is sown every year, and after flowering, cut down, though it will last for several years. In fact, in India, there is a species with red flowers, which grows to a regular tree; as well as another species in the Fiji Islands, (I *think* one of the genus gossypium,) which not only grows to a tree, but has seeds and flowers all the year round. When cultivated, it is grown very much like hops in our country. The ground is carefully dug over by hand, and raised into ridges; the seeds are sown in March; holes are dibbled in the ground 2 or 3 feet apart, and 4 or 5 seeds sown in each. When the plant is a few inches high, the weakest are removed, so as to leave only two together. In about 90 days the seeds are ripe, and of course all hands are busily employed in getting in the Cotton. The ground has to be kept very free from weeds, and in India, where cultivation is now carried on more scientifically, they require to water the plants; but in America this was never done. Since more attention has been paid to the supply of Cotton, it is now ascertained that it will grow in all tropical countries, and even as far north as the south of Italy. The Cotton of commerce came originally from India, where its manufactures have been known for a very long time. Egypt is also a native country of Cotton, but its manufacture there is of comparatively recent date. The mummy cloths were made of flax. In China there is a peculiar kind of Cotton, which is naturally brown, and which grows near Nankin; hence the name of Nankeen is given to cloth made of it. When there was a large demand for this kind of cloth, the Chinese, in order to render the supply equal to the demand, mixed large quantities of common Cotton with it, and so produced a cloth of a much lighter colour. The merchants, who at that time believed the Cotton was dyed, requested the Chinese to dye the cloth of a deeper colour,—so ignorant are we often of the origin of the products we use most commonly.

In America, there are two varieties of Cotton: the New Orleans and the Sea-Island; distinguished by the length of the *staple*, as the thread is called. The Sea-Island Cotton is much finer and larger than the other, and always grows well on land near the sea, and which is impregnated with salt. To such a degree is it impregnated, that one can sometimes *see* the salt in the land. Its value is very great; a pound of this cotton, which formerly cost 6s., can be spun into a thread 1,000 miles long, and be made into lace worth £250.

Of the uses to which the Cotton plant and its products can be put, are the following:—

(1)—The *Seed*, used not only for manure when buried in the earth in large quantities, but also for a very fine oil, as good as salad oil, and very good also for turning and lubricating machinery. Also, after the oil has been pressed out, the residue forms "cotton-seed cake," as useful as "oil-cake" for feeding cattle. "Thorley's Food" is composed of a mixture of these two. "cakes," seasoned with strong spices. It costs, however, far more than oil or cotton-cake, and is not so good for feeding cattle as either of them singly. Another product is obtained from the seed useful for making good common soap.

(2)—The *Stems*, when cut down, are used extensively in India for forming the sides of their country waggons.

(3)—The *Fibres* from the stem and bark are also useful for cordage.

(4)—The *Short Hairs* from the seeds (for they are of all lengths), are useful for making lint.

(5)—The *Cotton*, by certain processes, can be made plastic, so as to be easily moulded to any form, even by the finger, and this, when dried, becomes perfectly hard. Articles of furniture have been made of it, and in America, also tiles for roofing, which are said to be fire-proof. The American imagination has even extended so far as to form bricks of this prepared Cotton, and then houses, the walls of which are of one solid mass, and therefore water and fire-proof, and ultimately a regular city built of Cotton. Such a result is quite possible, but very improbable.

There were forty-one persons present.

MEETING APRIL 21st.

A List of the most interesting notices obtained during the last fortnight was read by the President. The total number was,—Botanical, 55; Entomological, 16; Ornithological, 18.

EXHIBITIONS:

An Emperor Moth, bred from larva, by J. Pole.

Ditto by A. C. Almack.

Ditto by W. W. Dayman.

A box of Eggs, taken this season, by H. R. Parrington, among which were those of the Barn-Owl, Kestrel, Jackdaw, &c.

Egg of Tawny Owl, from the Forest, by J. Pole.

Trachea Piniperda, and *Chimabacche Fagella*, by H. Brown.

H. Progemmaria; E. Lineolata, and other Moths, by R. C. Davis.

Cast of an Adder, from the West Woods, by Parrington.

Snake (alive), by P. S. Robinson.

Poisoned Arrows, Rose of Jericho (Anastatica Hierochuntia), Chameleon, Hawk's Claw, Lava, and Photographs of Kaffir Chiefs (all from South Africa), by Mr. Coldwell.

Case of Common Snail Shells, by A. C. Almack.

The following Paper was then read by P. S. Robinson,

ON BATS.

Bats, as a class, are as interesting as any of the interesting objects of nature; but, when taken singly, they present a great deal of sameness. For the difference between them, especially among the European species, often lies in nothing but a darker or lighter shade of greyish brown, or in one being rather larger or smaller than the other. The first person who mentions them at all in a scientific way is Aristotle. He is evidently much puzzled by them, and calls them birds with membranous wings; he does not like to call them *birds*, and as they do not possess four actual legs, he will not call them *quadrupeds:* and therefore tries to make them out to be a connecting link between the two. Pliny, in later times, calls them birds that are viviparous. It is curious that such creatures should have received so bad a name, and such ill-treatment, since all European bats are harmless to a degree; and, in my opinion, unless looked at closely, far from ungainly or ugly objects.

I will now proceed to their classification.—They were classed by Aldrovandus with ostriches; by Linnæus with monkeys and lemurs, and called *Primates.* But the opinion of Blumenbach and Olliger is by far the best, namely, that they ought to form a distinct class. These naturalists gave them the name of *Cheiroptera,* meaning, I suppose, creatures with hands and wings. Cuvier places them with the *Carnivora,* as they are for the most part feeders on animal matter. This classification of Cuvier has many faults, but the important fact that they are furnished with teeth is quite sufficient reason for placing them among flesh-eating creatures. Throughout the order they have three kinds of teeth, viz., incisor, canine, and molar; but the whole number is not fixed in any species, and it is remarkable that the more vegetable matter they eat, the more pointed do their teeth become.

Bats may easily be distinguished from all other creatures by the membrane, which extends from the extremity of the tail to the shoulders, enclosing the whole of the fingers, except the nails of the hind ones and one claw of the fore-feet. Their elongated fingers act as a kind of frame, like the rods of an umbrella, on which the membrane is stretched out. This membrane is extremely sensitive. As regards their other organs and limbs, I may here remark that their forearms have no circular motion; that they are unable to move their jaws horizontally; and that the mouth is very large in proportion to the rest of the body.

In birds, the fingers are mere rudiments, since the skin and feathers cover and extend far beyond the place where they would naturally be; but in bats they are marvellously developed so as to form a perfect hand. The hand and fingers of the bat are precisely similar to those of the ape, with the fleshy part changed into membrane. The thumb has a hooked nail, which enables the animal to crawl and hang, and which can, like that of the ape, be moved in many more directions than the other fingers, which have no nails at all. Bats, like monkeys, have cheek-pouches in which they store the flies they catch, so as to be able to devour them at leisure. The tail acts as a sort of rudder in their flight; without this they would experience considerable difficulty in catch- the insects on which they feed, and it is a curious fact that, in countries where they do not feed on insects, but on fruit, they have hardly any tail at all. Their skin is soft, and covered with short fur; their eyes often small, and almost as often large in proportion to their body. They make no noise except a feeble squeak, which is very seldom heard. If in any of the species a deficiency of sight does occur, it is more than compensated by the wonderful powers of scent and touch possessed by them. Their sense of touch, indeed, is so strong, that the naturalist Spallanzani thought they owed their powers of steering to a sixth sense. He once caught a number of these animals, and after closing, and in some instances taking out their eyes, and waxing up their ears, let them out in a room in which there were threads stretched and hung from the walls and ceiling, and was astonished to find that they flew about without touching a single thread.

As regards their anatomy they are almost precisely the same as the *Quadrumana* or monkey tribe; their brains, hearts, lungs, and digestive organs being the same to the minutest details. Two is the usual number of their young. Old bats suckle, using the wings as a covering, and for some time after birth the young are naked and of a black colour. These animals do not migrate as was once supposed, but hibernate, retiring about Autumn into holes and dark places, where they hang during the winter in a torpid state; and it has been discovered that while they are in this state circulation ceases, returning with the warm weather. Like swallows, bats drink on the wing. Their movements on the ground are ludicrous in the extreme; and, as a rule, they do not fly up straight from the flat surface, but shuffle along till they come to something more elevated, from which they can spread their extensive wings.

I shall now enumerate the most remarkable of the seventeen species of Bats which are said to exist in the British Isles.

1.—The Great Bat.—This species was first described by Daubenton, and after him made pretty well known by Buffon. It measures fourteen inches across from tip to tip of the wings, and about five in length. The shoulders are very thick and muscular, which accounts for their singularly high and rapid flight. In colour they are a reddish brown. They are very sociable, having been found under the roof of a College in Cambridge to the number of 180!!

They are voracious eaters, one having been known to eat nearly his own weight of food per diem.

2.—**The Great Horse-Shoe Bat.**—This bat receives its name from the mark on its nose, which resembles a horse-shoe. It is about thirteen inches across, and two long; of a reddish grey colour, much paler underneath.

3.—**The Long-Eared Bat.**—This species is distinguished from most other bats by the absence of the tunnel in the nose, by which others are gifted with their extraordinary powers of scent. The sight is also imperfect, owing to the smallness of the eyes, but the hearing, as a kind of compensation for these two defects, is wonderfully acute.

4.—**The Lesser Horse-Shoe Bat.**—This animal was first discovered in Wiltshire. Its length is two inches and a quarter; colour grey above, and yellowish underneath.

5.—**The Red Bat** is, from its colour, one of the least ugly of our British species.

6.—**The Common Bat** is about the size of a mouse, and about nine inches in width; though some are mentioned in White's Selborne fourteen inches and a half in width, and of a reddish colour. It has apparently great difficulty in chewing, and has been known to take several minutes in masticating one fly. Over the eyes there is a tuft of hair, while the spaces round them are quite bare.

7.—**The Whiskered Bat**, whose name tells its own story. This bat is about two inches long, and is of a solitary disposition.

8.—**The Parti-Coloured Bat** is decidedly the handsomest bat we have. Its upper side is of a rich chesnut colour, with the ends of the hairs grey, giving it rather a marbled appearance. Underneath it is white, with a large red patch on the breast.

9.—**The Serotine Bat** has nothing remarkable about it except the silkiness of its hair.

10.—**The Pigmy Bat.**—It is rather doubtful whether this bat is not the young of some other kind.

11.—**The Notch-Eared Bat.**

12.—**The Bearded Bat.**—These two last tell their own story. Besides these, five more species are known to exist, and many no doubt still remain to be discovered. A very large skeleton of one was found some time ago in Hampton Court, which, in the days of its existence, must have been at least as large as a pigeon.

We now come to Foreign Bats.—The most remarkable of all is the **Vampire**, measuring twenty-eight inches across, and occasionally even more. This bat has long been looked on as a mere wanton blood-sucker, but it has lately been discovered that it eats fruit in great quantities. It is, however, quite true that they do suck blood, no creatures being safe from their attacks, and they do it so gently that their victim is not awakened, and though the quantity actually sucked is not much, yet, as the wound continues to bleed after the bat drops off, there is altogether a good deal lost. It often happens that the same person is attacked repeatedly; while others sleeping in the same room are left unharmed. They always accompany travellers by night, and are of considerable use in devouring the annoying insects. They never settle on any one while awake; but, after all, it is extremely improbable that the effects are fatal to human beings. Their flight resembles that of pigeons, and their food consists of ripe fruit.

Next we come to the STRIPED PHILLOSTOMA, a little grey animal with a white stripe down the back, and a fleshy spot on the nose. It can run on the ground with great rapidity.

There is nothing very important to say about European Bats, most of them being the same as ours; so I will now pass on to the splendid HORSE-SHOE BAT, a native of Java. The colour is a clear brown above, and beneath, brown with drab blotches. The body is four inches long, and the wings nineteen and a half across.

In America there is a large species called the SPECTRE BAT, measuring more than two feet across the wings.

Next to that country, Ceylon is most fertile in Bats. There many of them are of the most brilliant colours: slate-blue, bright orange, yellow and chocolate being common. One of them, the FLYING FOX, is a most striking animal, measuring from three to four feet across. During the day they hang from the highest branches of the trees, which soon become stripped of their foliage. Their flesh is eaten by all the Portugese inhabitants of the island.

There were forty-five persons present.

MEETING HELD APRIL 28th, 1865.

THE President read a list of the most important among the last week's notices. The total number of Botanical notices obtained since April 21st was 136; of Entomological, 19; of Ornithological, 11.

The Exhibitions were the following:—

A large piece of club-moss, by the Rev. T. A. Preston.

A pot of palm-oil, a star-fish, and a specimen of a stone enclosed in wood, by the same.

Some ash-leaved lichen, and a morel, by R. B. Mainwaring.

A small box of moths, by J. Pole.

After the exhibitions, Mr. A. Armstrong read a paper on the OYSTER, and exhibited a diagram of the same.

The whole number of persons at the Meeting was forty-seven.

After the visitors had retired, there was a private meeting of the Society, at which J. W. Mills, A. C. Almack, and W. W. Dayman, were elected as a Committee to edit the report.

MEETING HELD MAY 5th, 1865.

THE President, as usual, read out some of the most interesting of the notices recorded during the past week.

The Exhibitions were the following:—

"Cuscus," by J. Bourdillon.

Some Emperor Moths, by W. W. Dayman.

A bunch of very forward currants, by R. R. P. Hilton.

Eggs of the Kite and Bee-eater, by A. C. Almack.

Nest and eggs of the Hawfinch, taken in the Forest, and exhibited by E. H. Carr.

Silk-cotton pods, by J. Bourdillon.

The following paper, written by J. W. Mills, was then read by A. C. Almack, in consequence of Mills having left the College:—

ON HUMMING BIRDS.

HUMMING Birds form quite a separate and distinct group in the large family of birds; for they are, in almost all instances, very much smaller than any of the other groups, even our English Wren being a large bird compared with many of these little fire-flies, some of which are no larger than a bee. Humming birds vary considerably in form, size, and brilliancy; but the chief difference between them and our English birds, is the before-mentioned one of size. They are found in the hot countries of South America, and other tropical regions, and may be seen skimming about like globes of fire. The scientific name they bear is *Trochilus*, probably given them from the great swiftness of motion they display. They are also termed *tenuirostral*, which means that they are birds with slender and lengthened beaks, and this leads me to say more about this organ.

The beak may perhaps be more easily understood, by considering it the very opposite to that of the bull-finch, the beak of that bird being short and thick, that of the Humming-bird long and thin. In some species it is straight, and in others curved either upwards or downwards, and this variation was formerly employed by naturalists as a means of distinguishing between the different genera and species, but is now considered merely as a characteristic of the whole family, while its chief divisions are settled more from the general habits and features of the different species, than from this somewhat striking variation. In some cases the beak is armed both on the upper and lower mandibles with small teeth sloping backwards. It is a curious fact, however, that these teeth do not extend quite to the tip of the beak, which is pointed, and in some cases curved downwards like a hook, the upper mandible is in most species larger than the lower one, and so partially covers it, as with a sheath; notwithstanding this shape, the beaks of all the species seem to be equally hard, and furnished with cutting edges, so that the difference of shape seems to be of no specific importance, and we may hence conclude, that the food of all Humming Birds is much the same.

We now come to the *tongue*, which lies coiled up in the mouth, and is very similar to that of the English Woodpecker, and other climbing birds, being longer than the beak, it is a most curiously shaped instrument, consisting of two muscular tubes, joined together for the greater part of their length, and swelling out towards the end into a kind of spoon; the portions of the muscular tubes next the head pass round the back of the skull, and meet between the eyes; when therefore the bird inserts its beak into the nectaries of flowers, and other minute cavities where small insects are concealed, the tongue lies contracted within the mouth, but at sight of an insect, darts forth with the rapidity of thought, and carries it to its mouth.

It was once believed that these birds lived entirely on the juices and honey obtained from the nectaries of plants, but it has been discovered that though this is partly the case, they also feed on insects to a large extent; this has been proved incontestibly by a gentleman who kept some in a cage, feeding them on sugar and water. At first they enjoyed the diet very much, yet, after a time, they began to flag and pine, but were soon restored to their accustomed vigour by a few young spiders, which they eat with great relish.

The *feet* are those of the creeper family, in fact just those of the English Nathatch, whose toes, being of unequal length, enable the bird to climb with greater ease.

The *wings* are very much like those of the Swift, and are generally larger than the tail; it has been noticed that the quills are very elastic, and that the outline of the wing is very much curved. All this little creature's muscular power seems concentrated in the organs of flight, and the result is the wonderful speed with which it flies; when hovering over a flower, the wings move so rapidly that the bird might be thought to be motionless, were it not for the beautiful and changing lustre of the wings, and the low, drowsy hum, like that of bees, which is heard, and from which it derives its name. It remains on the wing an immense time, and in fact has seldom been seen at rest.

This bird has been appropriately termed the "Bird of Paradise," for all the colours of the rainbow may be seen in its plumage:—ruby and amethyst, gold and silver—every hue may be seen as it flits along. It seems strange that Providence should have thought fit to adorn this fairy creature with all those dazzling colours, and then to send them forth by thousands and thousands to "waste their sweetness on the desert air," and spend their lives where no human eye can see them.

Some of them have long and slender tails, that droop gracefully down, and some have short, stumpy ones, that look as if they had been cut short. One species has a most curious tail, it goes straight out from the back for some distance, and then divides into two parts, like the two legs of a pair of compasses,—each part being longer than the body, and almost as thick. In another kind, the outer feather of each fork of the tail spreads out, and assumes the shape of the bowl of a spoon, or a racquet, whence the bird is called the Racquet-tailed Humming Bird; many have regular fan-tails, some have crests, some have a ruff round the neck, and what is still more curious, some have a kind of supplementary wing, coming out on each side of the head.

The reason for these birds seeming to shew different colours when in different positions is, that the sides of the fibres of the feathers are of a different colour from the surface of the wings, and so, as the direction varies with the bird's flight, the hues change from one colour to another.

Their nests are built with great delicacy, combining warmth with compactness. In size they vary as much as the birds themselves, the smallest known being about half an inch across the top; the materials of which they are made differ greatly according to the locality in which the nest is built, cotton, down, lichens, mosses, stalks and grass being generally used, and they are all glued together by the saliva of the bird. Part of the materials of the nest are usually wound round the stem of the tree or shrub to which the nest is attached, in order to make it more secure; and the texture is so close that the wind or rain seldom destroys it; the shape is just like a cup, except in some cases where it is more lengthened, and hangs down from the leaf of a reed-like plant—in this case the entrance is at the bottom. The eggs are generally two in number, of a white colour, and very small.

The period of incubation is usually about ten days, and we are told by Audubon that the young birds are ready to fly a week after they are hatched, from which fact it seems probable that these birds usually breed twice in the season, and perhaps more.

The question whether Humming Birds sing has been the cause of great contention among naturalists, but all their stock of music seems to consist in in an occasional shrill chirp, which may perhaps be a little altered in key, according to the different passions of the bird. Waterton satisfied himself that they did not sing. He tried for several years to hear one singing, and at last, as he was once sitting under an orange tree, thought that he did hear one singing close to him; he even fancied he saw the beak move, and fancied that he had at last solved the riddle; but upon moving a little aside, he saw just behind the Humming Bird a species of Sylvia or Warbler, which had been doing all the singing. Such is very probably the origin of the idea that they do sing, and, at any rate, if they do sing it seems rather strange that no one should have heard them. It is said that their chirp resembles the syllable *tere, tere*, often repeated: but they are generally dumb. Lesson, the naturalist, passed hour after hour alone in the forests of Brasil, seeing myriads of these creatures round him without ever hearing even a sound come from them.

Not only do they eat insects, as I said above, but they eat them in very large quantities. Mr. Gosse, who relates many interesting experiments which he made while trying to discover whether it was possible to keep them in confinement, tells us that when he kept some in a warm room, and fed them on syrup, he estimated the number of insects which they ate besides, and found that the lowest estimate was three per minute; and they continued devouring at this rate almost without intermission from dawn till dusk. He does not suppose, however, that the birds, when in a state of nature, consume so many, though they are constantly seen hawking for them. If, then, we allow the bird a minute's rest after each hunt, we may estimate the number at ninety per hour, that is one thousand and eighty in twelve hours, and this calculation would bear out the assertion of a distinguished naturalist, who said that a Humming Bird consumed daily its own weight of insects.

The names given to these birds in the countries of South America generally refer to their brilliant plumage. We find them translated into phrases like "Rays of the Sun," "Tresses of the day-star," and others. Humboldt relates the following curious Mexican tradition about them, viz., that when Torquamiqui, the wife of the god of war, had conducted the souls of those warriors that had died in defence of the gods into the mansion of the sun, she then transformed them into Humming Birds.

There must be at least six hundred kinds of these birds, if, judging from the number of those already discovered and known, we allow for those that would, in all probability, exist in those interminable forests of the West. I will now take four or five of the most striking species among them, and say a few words about them.

1.—There is a kind called *Trochilus leucotis* or white-eared, which has a distinct white mark extending from the eye to the back of the neck. The top of the head is tinged with green, the beak is yellow, the collar slightly blue, the chest green, and the back brown; the length being about three inches. This species is found among the Andes, and lives among storms of hail, rain, and thunder, where one would not expect to find so delicate a creature.

2.—*Trochilus cornutus*, or the Horned Humming-bird. It has two horns coming from either side of the head, and forming two feathered crests, each composed of six bright crimson feathers, edged with bright yellow. The head and neck are of a dark blue colour, the chest, and part of the body white, the wing feathers brown, tinged with green; the tail is of a large, wedge-like shape with the two centre feathers brown, and the rest white. The bird is about four inches long, and the tail is the same length as the body. It is found in Brazil, near the source of the Francisco. The female is perhaps rather more elegant in shape, but does not possess the crests.

3.—*Trochilus Delalandi*, named after its discoverer, M. Delalande. It has a curious crest of short feathers, with one of a rich blue colour, tipped with white rising up like a horn in the middle. The female has not the crest.

4.—*Trochilus Moschitus.*—(The Ruby-crest). If its crest is looked at from above it appears to be of ruby-red, if sideways it seems to be dull brown. The tail is broad and fan-like. The male is about three and a half inches long, and the female rather shorter. It builds a nest of cotton, patched on the outside with lichens.

The Secretary then gave out that H. W. Hockin, A. Marshall, and J. W. V. Taylor, had been elected members by the Committee, but that for the present, owing to want of room, they would not be allowed to bring a friend, and would be therefore called honorary members.

There was a private meeting of the Society, to elect a new member of the committee. The candidates were H. A. Evans, W, R. Carles, R. F. Isaacson, and J. Pole.

H. A. Evans was elected.

MEETING HELD MAY 12th, 1865.

The President, as usual, read out a list of notices recorded during the past week.

The exhibitions were the following:—

A small wasp's nest, by R. R. P. Hilton.

A deformed poppy, earth-nuts, a piece of *orchella-weed*, gall-nuts from Aleppo, Mirobalans from India and Valonia from the Levant, the two latter used for tanning, by the Rev. T. A. Preston.

A double dandelion, by W. Blaker.

A cuckoo's egg from a Sedge-warbler's nest, by W. Blaker.

Biston Betularia, S. Clathrata, C. Pamphilus, D. Mendica, P. Cespitalis, T. Alveolus, &c., by P. S. Robinson.

F. C. Lightfoot then read a good paper on the habits of the Honey Bee.

A private meeting of the Society was afterwards held, to decide whether the meetings should be held weekly or fortnightly, some members having expressed dissatisfaction at the weekly method, but upon a show of hands, the latter was carried by a large majority.

W. R. Carles was then elected to serve on the editing committee, in the place of J. W. Mills.

MEETING HELD MAY 19th, 1865.

The President, as usual, read out some of the most interesting notices recorded during the past week.

The exhibitions were the following:—

Nest of the Golden-crested Wren, by the Rev. T. A. Preston.

A Ruby Tiger-moth (*A. Fuliginosa*) by F. C. Lightfoot.

A Viper, by P. S. Robinson.

Curious fungi, and a nut-shell imprisoning grass, by Rev. T. A. Preston.

E. Glyphica and caterpillar, chrysalis and perfect insect of the five-spot Burnet (*A. Filipendulæ*) by J. Pole.

A half-formed wasp's nest, and some Woad from his garden in the College, by Rev. T. A. Preston.

Mr. Preston then read the following interesting and valuable paper

ON THE FERTILIZATION OF ORCHIDS.

BEFORE entering directly upon the subject of this paper "On the fertilisation of Orchids," it will be necessary to describe the structure of the flower of an Orchis. I cannot enter upon the subject of a comparison of the flower of these plants with those of plants in general, and it will, perhaps, be more to my purpose to proceed to *build up* an Orchis flower, instead of pulling it to pieces, as is generally done in descriptions of this kind.

An Orchis flower may be thus described:—At the bottom is a seed vessel, which, when ripe, splits into three parts, thereby showing that it is composed of three *carpels;* at the top of this seed-vessel ought to be three *stigmas,* corresponding to the number of the carpels. These stigmas consist of a layer of a gummy substance, instead of the true skin of the plant, and are really the only parts of plants which are not properly covered with a skin. Their object is to secure the grains of pollen, so as to prevent their falling off, whenever they happen to be deposited there by any means. In Orchids, instead of there being *three* stigmas, we find only *two,* the third being very curiously altered, varying in structure in the different genera, and which it will be better to describe more fully when treating of the species in proper order. On the top of the seed capsule, and at one side of it, near the altered stigma, is an upright stalk-like mass, called the *column,* corresponding to the *filament* of a stamen, in the front of which are two slits, through which may be seen two yellow masses; these yellow masses consist of *pollen.* In ordinary flowers the pollen is contained in loose grains, inside the anthers, and when these anthers burst, the pollen is scattered in all directions. Each pollen grain has two coverings, the inner one being very elastic, and when a grain falls on the stigma the outer covering bursts, and the inner one swells out into a long tube, which passes through the stigma into the seed vessel, and causes the production of seed, but by what means is not exactly known; at all events we know that unless the pollen is placed on the stigma, no seeds are formed. In Orchids, these pollen grains, instead of being loose, are fastened into wedge-shaped masses by highly elastic threads, and these wedges again are united into larger club-shaped masses, called *pollinia;* the threads connecting the smaller masses are joined together at one end into a kind of stalk called the *caudicle.* The pollinia are deposited in the two slits of the column, and kept there by two flaps; so that, unless by some special agency they were removed from the cavities in the column, it would be quite impossible for them to reach the stigma, consequently no seed could be formed, and the plants would ultimately become extinct. Surrounding all the parts already enumerated, are two circles of leaf-like organs, generally very highly coloured; each circle always composed of three of these leaves, which are called *petals* and *sepals* respectively. The outer row (of sepals) does not present many modifications of form, but the inner row (of petals) varies infinitely in appearance; one of them is, moreover, always expanded into a kind of lip, which plays a very important part in fertilization. The other two petals are similar to one another, but always of a different shape from the lip. Lastly, the lip is prolonged behind, in most cases, into a tube, sometimes of considerable length, in which is secreted a sweet juice called *nectar*, and hence the tube or spur is called a *nectary*.

I shall, on the present occasion, endeavour to explain the discoveries of Mr. Darwin, in connection with the means employed for conveying the pollen to the stigma, taking the more marked varieties of method as observed among the Orchids found already, or which will probably be found in this neighbourhood.

To begin, then, with the Early Purple Orchis (*O. Mascula*), which is coming out now.—In this species the third stigma (which I mentioned as being variously modified), is converted into a kind of closed bag containing fluid, to the top of which the caudicles of the two pollinia are attached. As soon as ever this part of the Orchis is touched, however slightly, the top of the bag splits, so as to leave two little discs attached to the ends of the caudicles. On the inner surfaces of these discs is a ball of a very sticky substance, which is kept moist by the fluid inside the bag. Let us see, then, how this mechanism acts,—Suppose an insect (*e.g.* a moth) to alight on the lip, which, from its size, forms a very good landing-place, and to insert its proboscis into the nectary. The position of this bag (or *rostellum*) is such that it partially stops up the entrance to the nectary; hence the moth, when it inserts its proboscis, necessarily strikes it against the bag, and no sooner is this done than the bag splits, as I have said, and the front of it is pushed down, leaving the inside of the rostellum exposed. The viscid discs of the pollinia almost invariably come in contact with the proboscis, and adhere so firmly in a few seconds, that when the moth draws back its proboscis, it necessarily pulls out with it either one or both of the viscid discs, and consequently the pollinia attached to them. The side of the rostellum which was pushed down is so elastic as to spring back the moment the proboscis is withdrawn, and then, in the case of one pollinium being left, it keeps its viscid disc moist, and ready to be fastened to another visitor, should one come.

The pollinia are thus removed from their cavities in the column, and are very soon firmly glued to the moth's proboscis; this is very necessary, for if the pollinium accidentally slipped to one side or backwards, it would be impossible (as can easily be seen) for it to strike the stigma of the flower next visited. But, even supposing it were properly glued to the proboscis, still, when the moth visited the next flower, the pollinia would merely strike against the cavities in the column, entirely missing the stigma, as it is placed too high. Here, therfore, occurs a wonderful instance of adaptation of ends to means. As soon as ever the pollinium is free, the disc to which the caudicle is attached (and which has hitherto been kept moist), immediately begins to contract, but in such a manner as to bring the pollinium from its upright position into one almost level with the proboscis, and pointing *forwards;* consequently, when the proboscis is inserted into the next flower, the pollinium strikes directly against the stigma, and this alteration of position takes place in about 30 seconds. As soon as the pollinium strikes the stigma, it sticks to it; but the gummy matter of the stigma is not adhesive enough to retain the whole pollinium, though is just enough so to break the threads connecting the wedge-shaped masses, and to keep a few of them adhering to it; the remaining bundles of the pollinium are therefore available for fertilizing other flowers.

In this case, then, we see how absolutely necessary it is that the plant should be visited by insects. Mr. Darwin covered up some plants, to prevent insects visiting them, and found that they never ripened any seeds, because none of the pollinia had been removed; it is also by no means an uncommon occurrence to catch moths with pollinia adhering to them; one, for instance, being taken with no less than *eleven* pairs of pollinia (though not of the species we are considering) attached to its proboscis. Now, doubtless insects would not visit plants for nothing, but must have some source of attraction; and hence the use of the nectary. Moths visit the plant for the nectar, and pay for their meal by removing the pollinia and fertilizing the flower.

But it is very curious that there are some species of Orchids which do not appear to have the power of secreting nectar, which yet regularly produce seed. Mr. Darwin examined such flowers at all hours of the day and night, hoping to find some traces of nectar, but was utterly unable to do so; and this led him to the following curious train of reasoning:—Is it possible that in these plants there exists any deception? Can the Germans be correct in supposing that they merely attract moths by their *appearance,*—that this grand-looking nectary, so conspicuous in many Orchids, is a sham (whence they call them sham-nectar-producers)? This was opposed to all his ideas of right and wrong. He could not believe that for thousands of years moths had been incessantly deceived, and that these beautiful and curious plants had been nothing more than impostors; so he examined the structure of such flowers more closely. Among some of his experiments he tried the effect of cutting off the lower half of the nectary, and found that far fewer flowers were fertilized; in fact, that fertilization was apparently only accidental in such cases. He also observed that the nectary was composed of two skins very far apart, the inner one very delicate, and the space between the two skins filled with a very copious fluid; hence he was induced to put forth the theory, one perfectly new to botanical science,—that these plants secrete nectar *between* the two skins of the nectary, As a confirmation of this theory, it may be observed that the gum of the viscid discs of such plants as these require rather more time to dry than those which secrete nectar in the usual manner. The moth, on visiting the flower, is obliged to bore through the inner delicate skin, which operation takes just time enough to allow the pollinia to be properly fastened to its proboscis.

Thus from the innate love of *truth*, and hatred of every kind of deception, did Mr. Darwin arrive at this most wonderful discovery; and, however much one may dissent from his theory of the origin of species, his name will ever be respected as being that of one of the most accurate and truthful of the students of nature.

But I must pass on now to other species. The next one I shall take will be the Pyramidal Orchis (*O. pyramidalis*), which has been found, though not commonly, about Marlborough.

In this species, the two stigmas lie *on each side* of the pouch or rostellum, which is itself so placed that it almost closes up the mouth of the nectary; while, on the lip of the flower, may also be observed two elevations with a channel between, leading directly to the rostellum; the two pollinia, moreover, are not separate as in the former species, but united to a single disc, shaped like a saddle, and much thicker between the pollinia than elsewhere. The walls of the rostellum are very delicate, and can be moved even by a human hair passed along the channel in the lip. When, therefore, a moth inserts its proboscis into the flower, it pushes down the front of the rostellum, leaving the under surface of the disc exposed. This will almost invariably adhere to the proboscis, and when removed will go through two movements. First, there is a contraction of the saddle so as to *embrace* the proboscis, naturally causing the pollinia to incline still further from one another. While this process is going on, a second movement takes place, similar to that in the former Orchis, so as to bring the pollinia on a level with the proboscis. When these two movements have taken place, it will be found that the pollinia will strike directly upon the stigmas of the next flower visited by the insect.

I next come to the genus *Ophrys*, embracing the Spider, Fly, and Bee Orchids. Here we have *two* rostellums instead of one, each pollinium being in a separate pouch. The viscid discs, when removed, do not contract, so as to bring the pollinia into a different position, but, as a compensation, the caudicle is twice bent, so as to assume the form of the letter Z. The nectary in the species of this genus is very small, containing no nectar, but in its place two shining lumps which *look* like globules of nectar, but are not, and certainly give one the idea of a sham nectary. Mr. Darwin will not believe in this, and is at present unable to discover their use; anyhow, these plants are very seldom visited by insects, and consequently very rarely produce seeds,—hence their general scarcity. As an instance of the rare visits of insects to these flowers, Mr. Darwin observed eleven plants of the Fly Ophrys, bearing in all 49 flowers, from which only seven capsules were produced. Two plants bore two each; three others one; and no less than six did not produce even a single capsule! He very justly remarks that something must be "out of joint" here.

I merely mention this, however, as introductory to the description of the Bee Ophrys, which has some very important modifications in its several parts. The two rostellums and stigmas are very similar to those of the other species of the genus, but they are so situated that the rostellum is directly above its corresponding stigma. The caudicles, too, are very long and very weak, and the pollinium has an extra bend forward from its position in the column, which is more than usually arched over the stigma. Let us see, then, the use of these modifications. As soon as ever the flower opens, the flaps which keep the pollinium in its case open too, and the pollinium, light as it is, drops down so as to be swayed about by every breath of wind. In this way it hangs till it is knocked against the stigma, where it adheres; and the plant is thus fertilised without the intervention of insects—the only instance of the kind in Orchidaceous plants hitherto known. But though this flower is self-fertilising, it has, nevertheless, appliances similar to those of the other members of its genus for having the pollen conveyed from one flower to another. It seems probable, therefore, that an occasional cross is necessary to its existence. To show how admirably this mechanism is suited for its purpose, Mr. Darwin remarks that he hardly ever observed a pollinium removed from its flower; one is *occasionally* though very rarely removed, and even in the cases where such has happened, traces of slugs are often visible. The blows from cattle, or the violent shaking caused by storms must also be considered shocks sufficient to account for the loss of most of the pollinia observed to be missing. Mr. Darwin, after careful watching, has never seen an insect visit one of these flowers, and is therefore unable to conjecture the meaning of the following quotation from a "List of Plants of South Kent."—"Mr. Price has frequently witnessed attacks made upon the Bee Orchis by a bee, similar to those of the troublesome *Apis muscorum*." But, as the plant is self-fertilizing, one may expect to find this species generally producing seed; and this is actually the case, for, as a rule, as many seed capsules are produced as there are flowers on the plant. In *very* few cases (except in deformed flowers) could a flower be found by Mr. Darwin which had not produced a capsule. How different is this from the Fly Ophrys, which produced only seven capsules out of forty-nine flowers.

Another species, occasionally found about here, requires a few words of comment. I refer to the *Peristylus Viridis*, or Frog Orchis. In this species the pouches are far apart, the ball of gummy matter does not soon dry, nor does the disc contract, so as to alter the position of the pollinium. To remedy this latter defect, the caudicle is doubly bent, as in Ophrys. The stigmas are united and form a small surface between the pouches. Though the pollinia are nearer to one another at the top than the bottom, it seems difficult at first sight to see how, when fastened to an insect, they can strike the stigma. But a curious contrivance obviates this. In the lip, and just in front of the stigma, is a deep hollow, with a small slit in it leading to the nectary underneath; an insect, therefore, in order to suck the nectar, would be obliged to bend down its head in front of the stigma. The lip has a ridge in the middle to prevent an insect alighting there; but in order to make sure of its not doing so, there are, besides the true nectary, two spots, one on each side, at the base of the lip, placed directly under the two pouches, and which also secrete drops of nectar. If an insect, then, were to lick up the nectar on either side, on first alighting on the flower, it would almost certainly get the pollinium on that side attached to its head, and if it afterwards proceeded to the mouth of the true nectary, it would assuredly strike the pollinium against the stigma. The movement of the pollinium is therefore supplied by this peculiar arrangement of two extra nectaries. Of course, if the insect sucked the true nectary first, and afterwards the side ones, it would get the pollinium on its head too late to fertilize that flower, but it would be all ready to fertilize the next one it visited; and thus a cross between two individuals would be secured.

I now come to the Butterfly Orchis (*Habenaria Chlorantha*). In this species the viscid disc is quite exposed, and remains moist for 24 hours after its pollinium has been removed. In order to prevent its being pulled off the insect's head by the first stigma with which it comes in contact, the threads connecting the small pollen masses are very much weaker than usual, and thus allow the same pollinium to fertilize several flowers. There is, moreover, a very curious variation in the form of the viscid discs: on the surface which is embedded in the column (for the viscid discs lie outside, exposed to the air), is a pedicel, something like a drum, to the top of which the caudicle is fastened at right angles, so that the latter lies parallel with the viscid disc. A few seconds after the pollinium is dragged out by an insect, two movements take place; one side of the drum contracts so as to draw the pollinium inwards, and, at the same time, the drum twists round through nearly a quarter of a circle, so that when the two movements are finished, the pollinium is exactly in a position for striking the stigma.

I shall terminate this paper by noticing the Twayblade (*Listera Ovata*), a plant more remarkable, perhaps, than any yet mentioned. In this species the rostellum is shaped like a leaf with numerous channels inside it, containing a gummy fluid, which sets hard in two or three seconds; white when first exposed to the air, but turning dark in less than a second. The tip of the rostellum is highly sensitive, the slightest touch even from a human hair serving to make it burst and discharge the supply of this gummy fluid. On the top of this rostellum are situated the pollinia, the threads of which are very slight, so as to permit of their being easily broken. The pollinia are protected above by the column which arches completely over, and at first almost touches the tip of the rostellum. The lip of the flower is very long and very narrow at the end nearest the flower, and is bent down vertically against the ovary, while along its centre is a channel which secretes a copious supply of nectar. As soon, therefore, as the flower opens, the rostellum sinks down a little so as to leave a clear passage for the pollinia, otherwise they would be glued in by the gummy fluid on the rostellum being touched. Suppose now an insect to alight on the lip and suck up the nectar. It will infallibly be conducted upwards, and, as the lip narrows, will go in only one direction, viz., straight up towards the top of the rostellum. On reaching the top of the lip, it lifts its head and strikes the rostellum at once; the gum immediately exudes, and *in-*

variably (it has never been known to fail) glues the pollinia to the insect's head. Observe now what takes place the moment the rostellum has exploded: it twists round so as to lie vertically instead of horizontally, and thus prevents the insect from approaching the stigma. In a few hours, or a day, the rostellum retires from before the stigma, not only resuming its former position, but even standing upright, so as to allow free access to the stigma, which is by this time more viscid, and ready for the pollen. In this species, then, we see that it is absolutely necessary that the pollen from one plant should fertilise another individual.

Insignificant as the flower is, it is a great attraction to insects; as an instance of the extreme irritability of the rostellum, may be mentioned the case of a tiny insect, which, though not so large as a pollinium, happened to touch the rostellum, when it was firmly glued there, unable to move away, and thus miserably perished.

MEETING HELD MAY 26th, 1865.

THE President, as usual, read out a list of the most important among the notices obtained during the preceeding week.

The exhibitions were the following:—

Two Green Forester Moths (*Procris Statices*), and the pupa-skin of a dragon-fly, by R. H. Brown.

Tail of the Rattle Snake by E. Berkeley.

Curious Fungus, by H. A. Evans.

Specimen of the Marsh-orchis (*O Latifolia*), by Rev. T. A. Preston.

A Lime-hawk Moth (*Smerinthus Tiliæ*) bred from larva, found near the College, by H. A. Evans.

A small Wasp's Nest, containing four cells and four eggs, by Rev. T. A. Preston.

A specimen of the Fly Orchis (*O. Muscifera*), by Rev. T. A. Preston.

Nest of the Reed-sparrow, by J. W. Parrington.

A Painted-lady Butterfly, (*C. Cardui*), caught near Marlborough by A. Marshall, and exhibited by him.

Adder's Eggs, by P. S. Robinson.

Egg of the Corn-Crake (the first taken this year) by J. Pole.

Some Sharks-teeth found in the Forest, by W. Koch.

The College collection of insects, as far as arranged, was placed on the table.

A Paper on OWLS was then read by J. Pole.

There were fifty one persons present.

MEETING HELD JUNE 2nd, 1865.

The President, as usual, read out a list of the most interesting among the notices obtained during the preceding week.

The exhibitions were the following :—

Some illustrations of Caca, Tea-plant, Liquorice, Orrice-root Cinnamon, Jalap, Logwood, and specimens of several of them, by Rev. T. A. Preston.

Larva of the Oil-Beetle, found on the Cricket-Ground by H. J. Vigor, and exhibited by J. Pole.

The Rev. T. A. Preston then read his second paper

ON THE FERTILIZATION OF ORCHIDS.

In my last Paper I noticed a few of the more marked methods of fertilization among *British* orchids. I now proceed to a few *foreign* species, and we shall see that the methods are not only different, but that new contrivances are also employed.

To begin with the genus *Cattleya*. In these orchids the pollen is arranged in waxy masses, with caudicles as usual, but not attached to the rostellum. The rostellum consists of a broad projection over the stigma, with a very copious supply of gummy fluid on its under surface, the pollinia lying on its smooth upper surface. The pollinia are placed in a receptacle in the column, the front being covered with a door having an elastic spring at the top. The pollinia lie perfectly free in this cavity, with their caudicles just projecting beyond the door and over the top of the rostellum. The lip of the flower is arranged so as to enclose the column as in a tube; when, then, a large insect, *e.g.* a humble bee, puts its proboscis down to the nectary it moves the rostellum ; but though it gets slightly smeared with the gummy fluid, it does not affect the position of the pollinia: on *withdrawing* its body, however, it strikes against the lower part of the rostellum, and immediately is coated with the viscid matter, which catches the caudicles as the body passes out, and thus the pollinia are fastened to the back of the bee, which, on entering another flower brings the pollen in contact with the stigma, and the plant is fertilized. It must be observed that a *cross* between two plants almost invariably takes place, this being a point which Mr. Darwin is endeavouring to prove in the case of Orchids especially.

I shall now describe the structure of *Dendrobium Chrysanthum*. In this species are several remarkable peculiarities. The pollen masses have no caudicles, and lie on the top of the rostellum, covered with the *anther*, which in this species is like a cap with a partition inside, so as to make the two cells requisite for the two pollen masses. This cap, again, is pressed down upon the rostellum by means of a very elastic thread (not elastic in all species of the genus, however), having one end fastened near to the top of the cap, and the other to one side of the rostellum. The under surface of the rostellum is very gummy, and at the bottom of the tube formed by the lip of the flower is the nectary, while the stigma lies just below the rostellum. When, then, a retreating insect, after sucking the nectary, strikes the under surface of the rostellum, it gets covered with the gummy matter, and the cap, on being touched, immediately twists round (scooping up the pollinia in its course) so as to lie on one side, the bottom of the cap now being vertical. This movement being very sudden from the action of the elastic thread, the pollinia are jerked out, and if they adhere to the insect, always do so in such a manner as to strike the stigma of the next flower visited by the insect. But in this species the pollinia do not always adhere to the insect, in consequence of the gummy matter not setting hard, and in this case a contrivance is brought into play, by which the flower can become self-fertilizing to a certain extent. If all the sepals and petals are cut away, and the rostellum then touched with a needle, the anther-cap at once springs round—out fly the pollinia into the air, and, on falling, invariably strike the stigma; but this will not be the case in nature, for the lip of the flower will be in the way of the pollinia when jerked out (this lip, I should mention, is very much thickened in its middle part, opposite the column, and is thereby made very elastic); in a natural state, then, the pollinia, on being jerked out of the anther-cap, supposing them to miss the insect, will strike against the lip itself in the act of springing back after being forced open by the insect; the lip will give them a blow which will send them in the opposite direction, so as certainly to strike the stigma. Such is the complicated action in this plant!

I now proceed to the *Vandeæ*, an enormous tribe, but without a British representative, and it will be as well to give a description of the general structure of these plants. The rostellum projects directly over the stigma, with the pollinia lying on its upper surface, protected by the anther, which leaves an opening in front as in *Cattleya*. The caudicles of the pollinia at first are not attached to the rostellum, but become so before the plant reaches maturity. The "viscid disc," which in other species merely performs the operation of smearing the insect with the gummy matter for catching the pollinia, is in this species very much modified. The *extremity* of the rostellum and its whole lower surface become excessively viscid, and as the flower advances to perfection the rostellum splits so as to allow the whole viscid portion and upper part, as far as the attachment of the caudicles, to be separated and removed together. The caudicles of the pollinia at first lie in grooves in the pollen masses, and are very elastic. Mr. Darwin found that though some caudicles were easily ruptured, others, on the contrary, were too strong for the viscid matter of the stigma, though they were capable of extreme extension, and upon careful consideration he found that when the pollen masses were pulled in the direction in which insects would pull them, the caudicles would come in contact with the projecting edges of the stigmas, and would be broken by the aid of friction, and that in this way the pollen is carefully preserved from being wasted.

In many cases the shortening of the rostellum by the removal of the viscid disc is sufficient to leave the stigma properly exposed, so that the pollen will strike it easily when the insect to which it is fastened enters the flower; but in many instances too the usual movement of depression is required, though it is remarkable to observe how this movement is regulated—where necessary it is very slight or very great, very slow or very rapid, but in all cases it is exactly such as would bring the pollen into the proper position; what really causes this movement is obscure, but one portion is certainly due to humidity. If the pollinium, after contraction be put under water, the whole gradually assumes its original position, and, on being removed, the disc contracts again so as to bring the pollinium into the right position for striking the stigma.

One very remarkable variation in this hygrometric contraction (if I may so call it) is that, in the case of *Maxillaria ornithorhynca,* the "pedicel of the rostellum" (*i.e.* the part between the caudicle and viscid disc) is very long, and is kept damp by the anther, and that, on the pollen being pulled out, this pedicel, instead of bending so as to bring the pollen into a forward and downward direction, does just the reverse, *e.g.*, if you conceive a bird's neck to represent the pedicel, and the head the pollen, in ordinary cases the movement is such as that made by a bird when picking up a grain of corn, the vertebræ close to the back being the only ones which move. But in this *Maxillaria* the movement is as if the bird threw its head back, only the vertebræ in the middle of the neck moving. This is a most admirable way of compensating for the length of the pedicel, for the stigma lies so high up that, without some such shortening, it would be impossible for the pollen to reach it.

Besides this hygrometric movement, another often comes into play, viz., that resulting from elasticity. This is very distinct from the former, and can be well distinguished by putting the pollinium under water; if the movement results from elasticity no change takes place, which is not the case, as we have seen, in the hygrometric movements. The movements due to elasticity are as varied as ever. Sometimes the pedical springs up at right angles to its former position; this movement is for the purpose of pulling the pollen out of the anther-cells, and the hygrometric movement then comes into play, and brings the pollen masses into their former position, only outside the anther. Sometimes the pedicel is merely curved, and sometimes it curls up in the middle, all these movements being performed in order to shorten the pedicel.

In *Calanthe masuca* we meet with a very curious arrangement. The stigmas are oval, and situated deep on each side of the rostellum, the "viscid disc" is oval, and has no pedicel, but eight masses of pollen are attached to it by very short and easily-ruptured caudicles, and these pollen masses radiate from the disc like the spokes of a fan; the rostellum is broad, and has its sides sloping on each side towards the two stigmas. If a needle be inserted into the nectary the disc and its eight masses adhere to it, and are pulled out, the pollen undergoing no change of position; but when the needle is inserted into another flower, the pollen necessarily hits against the sloping sides of the rostellum and, glancing off both ways, strikes down upon the two stigmas; and when the thin caudicles break the pollen is left adhering like little darts.

Angræcum sesquipedale, a beautiful Madagascar plant, must be noticed. This plant has a nectary eleven-and-a-half inches long, with only the lower one-and-a half inches filled with fluid. Mr. Darwin found that only by inserting a cylinder one-tenth of an inch in diameter, and pushing it down as far as possible, so as to be pushed against the viscid discs, could he get out the pollen.

Another genus, *Acropera*, must be noticed for another reason. Mr. Darwin, on being supplied with flowers of this plant, could not by any means manage to fertilize it. The caudicles were very long, and yet the entrance to the stigma was so narrow that he could only with the greatest difficulty insert a pollen mass into it, while the surface of the stigma was also remarkably dry. He tried drying the masses so as to diminish their bulk, but still it was quite clear that the plant was never intended to be fertilized. He was almost giving it up in despair, therefore, when the idea occurred to him "Can this be a male plant?" Such a thing as male and female flowers in Orchids never having been known before, he was the more careful in thoroughly examining every part. The "seeds" under the microscope presented every appearance of being merely stalks, or perhaps only skins, without any nucleus, so that they were merely representatives of seeds. Considering all things, then, he has come to the conclusion (since confirmed in other species) that there are such things as male, female, and hermaphrodite flowers of Orchids, of which this *Acropera* is a male plant.

I now come to the most wonderful of all the Orchids,—the *Catasetidæ*. The pollinium in this family is furnished with a very large viscid disc, but its position is such that it is impossible for an insect to rub against it; yet, as we shall find that the plants of the genus *Catasetum* are males, it is clear that insects must play an important part in fertilizing the plants. The pollinium is bent nearly into a circle, so that the viscid disc lies at the back of a cavity above the stigma, which may be called the stigmatic chamber. The pollen is kept down by the front portion of the anther case; the caudicles are very short and very brittle, whereas the pedicel is very large and egg-shaped, quite covering the projection above the stigma. Now, as there is no source of attraction for insects in the stigmatic chamber, how can insects assist in the fertilization? The plants of this genus have what Mr. Darwin calls *antennæ*. These antennæ are two long thread-like bodies, springing from each side of the pedicel, which is itself fastened to these antennæ in such a way that when the flower opens, it is exactly similar to half an india-rubber ball stretched over the rostellum; the two sides are kept down by being fastened to the antennæ, and the top is kept in position by the anther case, which covers the pollinia. These antennæ hang down in front of the nectary, the right-hand one appearing useless, whereas the left-hand one projects slightly, and is turned up so as to protect the entrance to the nectary, which itself secretes no nectar, but its *walls* are very pulpy and sweet. When then an insect alights on the lip to nibble the walls of the nectary, it will infallibly strike against the left-hand antenna, when, quick as thought, the sides of the pedicel are ruptured and the whole pollinium springs out, viscid disc foremost, and is fastened to the insect. This sudden spring of the pollinium is due to two causes. If a piece of whalebone, weighted at one end, is bent into a semicircle, and then suddenly let go, it springs forward; so again if a piece of a quill be split and placed on a pencil too large for it, it will spring forward as soon as it is let go. Both these moving forces come into play in the case of the pollinium of *Catasetum*. The anther retains the pollen for a very short time after the rupturing of the pedicel, so that the viscid disc has had time to swing round into such a position that it is the first part of the pollinium which comes in contact with the insect.

It has been mentioned that the right-hand antenna hangs down apparently useless, whilst the left-hand one projects forward; and it has been found that this left-hand antenna is the only really sensitive portion of the plant. The right-hand one is, to a certain extent, sensitive, but requires a very sharp blow to cause it to produce any effect, while any other part of the plant is quite incapable of producing any effect in freeing the pollinium. If the plant be slightly withered, the sensitiveness is very materially affected, but its perfection is restored by putting the plant in water, and hot water (but not hot enough to burn the finger) causes the pollinia to spring forth spontaneously. There are no less than 70 or 80 cells through which the sensation produced by the slight touch to the end of the antenna has to pass, and yet the freeing of the pollinium takes place almost as soon as the antenna is touched. The strength of the pedicel is very remarkable: it can support a weight of 1262 grains for a few seconds; a less weight for a much longer time. This shows that the insect necessary for fertilizing the plant must be very strong. The viscid disc is also very large, apparently in order to gum the pollinium well to the insect's back; moreover, the force with which it is discharged is sufficient to carry it to a distance of three or four feet. Under these circumstances, then, it would appear that the extreme sensitiveness of the antenna would be liable to cause the pollinia to be discharged inopportunely, and thus be wasted; hence we shall find that though great, the sensitiveness is not more than is necessary.

The foregoing is a description more especially of *Catasetum saccatum*, but the general structure is similar in all the other members of the genus. One species, *Catasetum tridentatum*, must, however, be more particularly mentioned. This plant differs very considerably in outward appearance from *C. saccatum*. The lip is very much shorter, both antennæ are sensitive, and the whole plant is turned topsy-turvy, so as to make the lip lie uppermost. Though its whole appearance is thus different from that of *C. saccatum*, its *structure* is the same. But the interesting particular about it is the following.—Botanists were amazed when Sir R. Schomburgk stated that he had seen this flower with two others (so unlike it and one another that they had been placed under three distinct genera), viz., *Monachanthus viridis*, and *Myanthus barbatus*, growing upon the same plant. He also stated that in Essequibo, the native country of these species, he had seen hundreds of plants of *C. tridentatum*, without finding one specimen with seeds, but that he was surprised at the gigantic seed vessels of *Monachanthus*. Mr. Darwin then examined these plants more particularly, and found that in *Catasetum* there was no viscid stigma, the ovules were only rudimentary, and the seed vessel was very short; and since seed capsules have never been observed, he concludes that this is a *male* flower.

Turning, then, to *Monachanthus*, he observed that this flower had no antennæ, that there was no viscid disc, that the rostellum was less protuberant, and the pollen masses only rudimentary; and thus that all the male organs were merely represented, without being of use. On the other hand the stigma was viscid, the ovarium was very much larger, and was observed to produce seeds abundantly; hence he considers that *Monachanthus* is a *fertile* flower.

The third species, *Myanthus*, is formed partly on the plan of each. It has the antennæ, like *Catasetum*, with good pollen; the stigma and ovary perfect; and the ovules good, though not so numerous as in *Monachanthus*, and hence he concludes that this is an *hermaphrodite* flower. The genus *Catasetum*, therefore, is particularly interesting from its three forms of flower, from its sensitive antennæ (which occur in no other genus), and from the whole mechanism whereby the seeds are fertilized.

I shall now only refer to one more species of this sub-family, viz., *Mormodes ignea*. The shape of this flower is most extraordinary; the pollinium lies curled round the rostellum, as in *Catasetum*, with the anther produced into a long point above. At a short distance from the top of the anther is a bend, which forms a highly sensitive hinge; the lip is turned up right over the flower, and rests on the top of the anther, so as to assume quite the appearance of a cocked hat; there is no nectary, but the walls of the flower beside the stigma (which is very large and long) are very sweet and pulpy. When an insect, then, alights on the lip, it either presses upon the top of the anther so as to move the joint, or touches the joint in leaning over to nibble the juicy sides around the stigma; no sooner is this joint moved than the pollinium is discharged, and invariably adheres to the insect's head or body. The causes for the discharge of the pollinium are the same as those in *Catasetum*. The direction is also guided by the anther not giving way at once, so that the pollinium swings round the end retained by the anther, and when it has gone so far round as to be in a direct line with the insect, the anther gives way, and the whole mass strikes against the insect. If the lip be cut off, and the hinge touched, the pollinium will fly up straight into the air, and then fall directly on the stigma. "But," it may be asked, "why does not the pollinium strike against the lip, if the lip is bent directly over the flower?" An arrangement, found only in this species, obviates this difficulty; the column of the flower is twisted in such a manner that in flowers which are on the right-hand, it faces to the right, and on those on the left-hand to the left. Were it not for this, the pollinium *would* strike the lip and be lost.

I shall now only refer to *Cypripedium*, of which we have one representative in England, though very rarely found. This genus is totally different from all other Orchids, and is more separated from them than any two other genera are from one another, greatly as they vary, as we have seen. In Orchids generally the two pollinia go to form *one* stamen, placed in the centre, but in *Cyprepedium* there are *two* stamens, one on each side of the column, whilst the stamen which is developed in other Orchids is in this genus changes into a kind of shield, with a deep notch in it, and placed directly in front of the stigma and stamens. The pollen, instead of being in waxy masses, is here granular, and bathed in a gummy fluid; the stigma, which is ordinarily coated with a gummy fluid, is in this genus quite dry, and the lip is so folded that it quite defends the stigma and anthers, presenting the appearance of the toe of a slipper, whence the name "Lady's Slipper" is given to the plant. It is evident, then, that an insect, in order to get to the nectary, must either put its proboscis behind the shield-like anther, and thus rub against the two pollen-bearing ones, or it must put it through the slit in the barren anther, and thus come directly on the stigma. If it gets to the nectary by the former channels first, its proboscis will come in contact with the glutinous grains of pollen, some of which will adhere to it, and if, again, it gets to the nectary through the slit in the third anther, it will strike the stigma, and thus fertilize the plant; but it is clear that the chances of this plant being fertilized are slight, and hence the reason, probably, why it is so rare.

I have thus endeavoured to describe some of the more marked methods of fertilization in Orchids, and I think it will strike everyone how careful nature seems to be of the pollen, and what elaborate means are taken to secure the proper fertilization of the seed. These seeds are produced in Orchids in vast profusion, for they are very small. Mr. Darwin has made certain calculations, and I will take an extract from his book referring to this.

FROM DARWIN'S FERTILIZATION OF ORCHIDS.—p. 344.

"I was curious to estimate the number of seeds produced by Orchids, so I took a ripe capsule of Cephalanthera Grandiflora, and arranged the seeds as equally as I could in a narrow hillock, on a long ruled line, and then counted the seeds in a length, accurately measured, of 1-10th of an inch. They were 83 in number, and this would give for the whole capsule 6020 seeds; and for the four capsules borne by the plant 24,000 seeds. Estimating in the same manner the smaller seeds in Orchis maculata, I found the number nearly the same, viz., 6200; and as I have often seen above 30 capsules on the same plant, the total amount will be 186,300, a prodigious number for one small plant to bear. As this Orchis is perennial, and cannot in most places be increasing in number, one seed alone of this large number, once in every few years, produces a mature plant. I examined many seeds of the Cephalanthera, and very few seemed bad.

To give an idea what the above figures really mean, I will briefly show the possible rate of increase of O. maculata. An acre of land would hold 174,240 plants, each having a space of six inches square, which is rather closer than they could flourish together, so that, allowing twelve thousand bad seeds, an acre would be thickly clothed by the the progeny of a single plant. At the same rate of increase the grandchildren would cover a space slightly exceeding the Island of Anglesea; and the great grandchildren of a single plant would nearly (in the proportion of 47 to 50) clothe with one uniform green carpet the entire surface of the land throughout the globe.

What checks this unlimited multiplication cannot be told. The minute seeds within their light coats are well fitted for wide dissemination; and I have several times observed seedlings in my orchard, and in a newly-planted wood, which must have come from some little distance. Yet it is notorious that Orchids are sparingly distributed; for instance, this district is highly favourable to the order, for within a mile of my house nine genera, including thirteen species, grow; but of these one alone, Orchis morio, is sufficiently abundant to make a conspicuous feature in the vegetation; as is O. maculata in a lesser degree in open woodlands. Most of the other species, though not deserving to be called rare, are sparingly distributed; yet, if their seeds or seedlings were not largely and habitually destroyed, any one of them would, as we have just seen, immediately cover the whole land."

There were forty-three persons present.

MEETING HELD JUNE 6th, 1865.

The President, as usual, read out a list of the most important notices obtained during the preceding week.

The exhibitions were the following:—

P. Priamus, a large and beautiful American Butterfly, belonging to the Rev. G. W. De Lisle, by P. S. Robinson.

Specimens of the following Moths, by P. S. Robinson.—*N. Plecta*, *C. Vinula*, *A. Basilinea*, *O. Bidentata*, *M. Brassicæ*, *X. Rurea.*

Six large cases of Indian and Chinese Butterflies, by J. W. Harrison.

A large hive of honeycomb, lent by the Rev. T. A. Preston, exhibited by F. C. Lightfoot. N.B.—The bees had probably been destroyed by "robbers."

P. Bucephala.—Buff-tip Moth, bred by G. K. Mills.

Collection of Eggs formed for the occasion by various members of the College, by J. Pole. Among them were eggs of the Tawny Owl, Long-eared Owl, Hawfinch, Grasshopper Warbler, Red-backed Shrike, Redstart.

The third drawer of the College collection of Lepidoptera, by W. W. Dayman.

Amber, containing flies, by H. A. Holland.

Swallow-tail Butterflies, (*P. Machaon*), bred for the College Collection, by A. C. Almack.

A paper was then read by H. A. Evans on SNAKES.

There were 52 persons present, among them H. T. Stainton, Esq., F.L.S., F.G.S.

MEETING HELD JUNE 16th, 1865.

The President, as usual, read out a list of the most important among the notices recorded during the preceding week.

The exhibitions were the following:—

Several specimens illustrating the peculiar growth of the Bramble, by the Rev. T. A. Preston.

Nest of the Golden-Crested-Wren, by H. R. Parrington.

Specimens of the Bee Ophrys, sent by T. W. Jones, a former member of the Society, by Rev. T. A. Preston.

Hybernated Specimen of the Clouded Yellow Butterfly, (*Colias Edusa*), caught on the Common by J. W. Whitaker.

A short Paper was then read by H. M. Moule, Esq., on "Our Predecessors in Natural History."

MEETING HELD JUNE 23rd, 1865.

The Exhibitions were the following:—

A deserted Wasp's Nest of the preceeding year, which had been filled by Caterpillar's Webs, and from which more than thirty specimens of ***Aphomia Colonella*** had been bred, by Rev. T. A. Preston.

Curious Yellow Fungi, by the same.

Humming-bird Moths (*M. Stellatarum*) taken near the Marlborough Station, by R. H. Brown.

Specimens of the Green Hair-streak Butterfly, (*T. Rubi*), taken by C. R. W. Hardy, on the Coast of Hampshire, by G. K. Mills.

Specimens of ***Plusia Iota,*** by the same.

A large Snake's-skin, by P. S. Robinson.

This being the last Meeting of the Half-year, there was no paper read, but the Secretary made a few comments on the flourishing condition of the Society, and gave the aggregate number of Notices recorded during the Half-year. They were Botanical—805; Ornithological—72; Entomological—226: also the average number of persons present at the Meetings, which was 43—2.

FORMER MEMBERS OF THE SOCIETY.

J. W. MILLS (Committee).

T. W. JONES.

P. LOWE.

H. A. WILLIAMS.

PLANTS.

In the following List, unless mentioned to the contrary, the dates given are those of the times of first flowering. "By" is added when the plant appeared to have been in flower a few days. An asterisk (*) indicates that the specimen observed was a cultivated one.

Names in Capital Letters indicate that the plants have not hitherto been recorded as occurring near Marlborough; those in Italics, that they have been observed in a new locality.

JANUARY TO MARCH, 1865.

Ranunculus ficaria ...	Pilewort, March 6; *W. W. Dayman; not* fully out till the beginning of April. Still in flower, May 1.
* Eranthys hiemalis... ...	Winter Aconite, by Feb. 9; going off March 5.
Viola odorata	Sweet Violet, March 23; over by April 26.
Stellaria media	Chickweed, March 18; perhaps a little earlier.
* Ribes Grossularia	Gooseberry; leaf buds March 7.
* R. rubrum	Red Currant, leaf buds March 29.
* R. sanguinea	Scarlet Ribes, flower buds appearing Feb. 28.
* Philadelphus Coronarius	Syringa, leaf buds March 13.
Sambucus nigra	Elder, young leaves by February 24.
Viburnum lantana... ...	Mealy Guelder Rose, flower buds appearing February 24.
V. Opulus	Guelder rose, leaf buds March 13.
Bellis perennis	Daisy, March 31. *J. W. V. Taylor.*
Leontodon Taraxacum ...	Dandelion, March 12. *Rev. R. Dell.* Very few flowers in March.

Veronica polita	Grey Field Speedwell, March 18, perhaps earlier.
Mercurialis perennis	Dog's Mercury, March 27.
Salix caprea	Great Sallow, catkins appearing March 9, not in flower till the end of the month.
Corylus Avellana	Hazel, male catkins, February 24. Fertile flower by March 10; still in bloom, April 3.
*	Crocus, just appearing above ground, Feb. 20. A few yellow ones in bud Feb. 24. In bloom during March and beginning of April.
* Galanthus nivalis	Snowdrop, buds hanging down January 18. Generally in bud February 9. In flower Feb. 20; fairly over by the end of March.
* Scilla bifolia	Squill, above ground Feb. 27. First flower March 21.
* Scilla Sibirica	February 27.

APRIL, 1865.

Anemone nemorosa	Wood Anemone, April 6. *J. Pole.* Nearly over by the end of the month.
* A. Apennina	April 11.
Ranunculus heterophyllus	Water Crowfoot, April 16. *W. R. Carles.*
R. auricomus	Goldilocks, Flower, with seed, April 20. *J. W. V. Taylor.*
R. bulbosus	Buttercups, April 24. *A. Marshall.*
* R. gramineus	April 27.
Caltha palustris	Marsh Marigold, April 13. *W. W. Dayman.*
Chelidonium majus	Celandine, April 26.
* Corydalis solida	Solid-rooted Corydal, in bud April 3, nearly over April 19.
Fumaria officinalis	Fumitory, April 20. *H. W. Hockin.*
* Dielytra spectabilis	Bleeding Heart, nearly out April 19.
Barbarea vulgaris	Yellow Rocket, April 30. *A. T. Rickards.*
Cardamine hirsuta	Hairy Bitter Cress, April 8. *R.B.Mainwaring.*
C. pratensis	Cuckoo Flower, April 20.
Sisymbrium Thalianum	Thale Cress, flower and seed May 2. *E. Allfrey.*
Alliaria officinalis	Sauce-alone, flower buds bursting April 25.
Brassica campestris	Wild navew, April 20. *J. W. V. Taylor. R. R. P. Hilton.*
Sinapis arvensis	Charlock, April 25. *A. Marshall.*
* Draba aizoides	Yellow Whitlow Grass, April 6.
D. verna	Whitlow Grass, April 6. *J. Pole.*

Potentilla Tormentilla	Tormentil, April 29. *J. Pole.*
Capsella Bursa-pastoris	Shepherd's Purse, not generally in flower till about April 18.
Viola hirta	Hairy Violet, nearly over by end of April.
V. sylvatica	Wood Violet, still in flower by end of April.
V. tricolor	Heartsease, April 5. *P. S. Robinson.*
Polygala vulgaris	Milkwort, April 29. *D. J. Blyth.*
Lychnis diurna	Red Campion, April 16. *R. B. Mainwaring.* Not generally out by April 30.
Stellaria Holostea	Stitchwort, April 24. *A. Marshall.*
Cerastium glomeratum	Broad-leaved Mouse-Ear, April 8. *R. B. Mainwaring.*
* C. arvense	Field Chickweed, April 29.
* Tilia parvifolia	Lime, first leaf April 16, full leaf April 29. *J. W. V. Taylor.*
Acer campestre	Maple, first leaf April 21, full leaf and flower April 26.
* A. Pseudo-platanus	Sycamore, first leaf April 17. *R. H. Brown.* Flower April 22. *Mrs. Blake.*
* Æsculus Hippocastanum	Horse Chestnut, bud April 6, first leaves April 11, full leaf April 22, flower April 25. *J. W. Parrington.*
Geranium rotundifolium	Round-leaved Crane's-Bill, April 29.
G. molle	Dove's-Foot, April 28. *R. R. P. Hilton.*
G. lucidum	Shining Crane's-bill, April 27.
G. Robertianum	Herb Robert, April 27. *L. S. Lloyd.*
Oxalis acetosella	Wood Sorrel, April 17. *J. Pole.*
Euonymus Europæus	Spindle Tree, leaf, April 10. *R. B. Mainwaring.*
Rhamnus Catharticus	Buckthorn, leaf April 22. *L. C. Calley.*
Ulex Europæus	Furze, April 3. *J. Pole.*
Medicago lupulina	Medic, by April 23. *J. Pole.*
Trifolium pratense	Purple Clover, April 28. *R. B. Mainwaring.*
Vicia Sepium	Bush Vetch, April 19. *J. G. Crosse.*
Lathyrus macrorrhizus	Tuberous Vetch, April 24. *H. A. Evans.*
* Cytisus Laburnum	Laburnum, leaf April 19, full leaf April 28.
Prunus communis	
(*Var.*) Spinosa	Sloe, April 16. *A. C. Almack.*
(*Var.*) Insititia	Bullace, April 21.
* P. Padus	Bird-Cherry, full flower April 29. *R. H. Brown.*
P. Avium	Wild Cherry, April 16, full leaf April 23. *R. R. P. Hilton.*
* P. Lauro-cerasus	Laurel, April 27.
Poterium sanguisorba	Small Burnet, April 30. *T. E. Maclean,* and *W. R. Carles.*
Alchemilla arvensis	Parsley Piert, by April 20.
* Sibbaldia procumbens	... ... April 22.

	P. Fragariastrum	Barren Strawberry, April 7.
	Fragaria vesca	Strawberry, April 21. *W. W. Dayman.*
	Geum urbanum	Common Avens, April 25. *J. W. V. Taylor.*
	G. rivale	Water Avens, April 25.
	Cratægus Oxyacantha	Hawthorn. leaf buds April 7, leaves April 10. *R. B. Mainwaring.*
	Pyrus Malus	Crab Tree, April 25. *A. Marshall.*
	(*Var.*) Acerba	April 28. *D. E. Leighton.*
*	P Aucuparia	Mountain Ash, leaf April 22.
*	P. Aria	White Beam Tree, leaf April 30. *A. Marshall.*
*	P. Japonica (?)	April 8.
*		Plum (against wall), April 9.
* *		Apricot Nectarine } April 10, earlier in very warm gardens. *A. Armstrong, Esq.*
*		Apple, leaf buds bursting April 9.
*	Sedum Rhodiola	Rose Root, April 27.
*	Ribes Grossularia	Gooseberry, full leaf April 8. *W. R. Carles.*
*	R. rubrum	Red Currant, April 13.
*	R. sanguinea	Scarlet Ribes, April 15.
*		Yellow Ribes, nearly out April 19.
	Saxifraga tridactylites	Rue-leaved Saxifrage, April 20.
	S. granulata	White Meadow Saxifrage, April 20 at Overton, still in bud April 25th at Marlborough; out before April 30. *C. J. Cummings.*
*	S. Spathulata	April 25.
	Pimpinella Saxifraga	Burnet Saxifrage, April 23. *J. W. V. Taylor.*
	Scandix Pecten-Veneris	Shepherd's Needle, April 25. *A. Marshall.* I think a specimen was brought about a week earlier.
	Anthriscus Sylvestris	Wild Chervil, April 21. *J. W. V. Taylor.*
	Adoxa Moschatellina	Moschatel, April 1. *A. C. Almack.*
	Cornus Sanguinea	Dogwood, leaf April 21. *L. C. Calley.*
	Sambucus nigra	Elder, full leaf April 23.
	Viburnum lantana	Mealy Guelder Rose, April 29. *A. Marshall.*
*	V. Laurustinus	April 5.
	Lonicera Periclymenum	Honeysuckle, leaves by April 3.
	Sherardia arvensis	Field Madder, April 30. *R. R. P. Hilton.*
	Galium cruciatum	Crosswort, April 24. *A. Marshall.*
	Valerianella Olitoria	Corn Salad, April 25.
	Petasites vulgaris	Butter-bur, April 10. *J. Pole.*
	Tussilago farfara	Colt's-Foot, April 1.
	Senecio vulgaris	Groundsel, by April 4; probably much earlier.
*	Inula Helenium	Elecampane, just appearing above ground April 6.
*	Doronicum Pardalianches	Leopard's-bane, April 27.
*	Rhododendron... Sp.	April 26.

Fraxinus excelsior	Ash, leaf buds April 22, young leaf April 24, flower by April 25. *J. Pole.*
* Syringa vulgaris	Lilac, April 29.
Vinca minor	Lesser Periwinkle, April 5. *J. W. Mills.* Perhaps earlier.
V. major	Greater Periwinkle, April 23. *L. C. Calley.*
* Gentianella	April 18.
Nemophila (self sown)	April 26. *A. Marshall.*
Symphytum officinale	Comfrey, April 30. *F. S. Dayman* and *J. Pole.*
* Pulmonaria officinalis	Lungwort, full flower April 15. *W. W. Melville.*
Lithospermum arvense	Corn Gromwell, April 29. *J. W. Parrington.*
Myosotis arvensis	Field Scorpion-Grass, April 30. *A. Marshall.*
M. collina	Early Scorpion-Grass, by April 30. *A. T. Rickards* and *C. Bean.*
Atropa Belladonna	Deadly Nightshade, appearing above ground, April 6.
Lathræa Squamaria	Toothwort, April 24. *J. W. V. Taylor.*
Veronica Chamædrys	Germander Speedwell, April 27.
V. serpyllifolia	Thyme-leaved Speedwell, April 24. *R. B. Mainwaring.*
V. agrestis	Green Procumbent Speedwell, April 26. *R. R. P. Hilton.*
V. Buxbaumii	April 4. *J Pole.*
V. hederifolia	Ivy-leaved Speedwell, April 4. *J. Pole.* Much earlier.
Nepet Glechoma	Ground Ivy, April 9. *J. W. Mills.*
Lamium amplexicaule	Henbit, by April 17.
L. purpureum	Red Dead-nettle, April 6, (much earlier.) *J. Pole.*
L. album	White Dead-nettle, April 13. *W. W. Dayman.*
L. Galeobdolon	Yellow Archangel, April 25. *Mrs. Blake.*
Ajuga reptans	Common Bugle, April 29. *J. W. Whitaker.*
Primula vulgaris	Primrose, a few flowers out before Christmas; not regularly out till beginning of April.
(*Var*). caulescens	April 14.
P. veris	Cowslip, April 7. *W. H. Lipscombe.*
Plantago lanceolata	Ribwort, April 24. *R. B. Mainwaring.*
Chenopodium Bonus-Henricus ;	All-good, April 27.
Rumex acetosa	Sorrel, April 24. *A. Marshall.*
* Asarum Europæum	Asarabacca, April 11.
* Buxus sempervirens	Box, April 29.
Euphorbia Helioscopia	Sun Spurge, April 20. *J. Pole.*
E. amygdaloides	Wood Spurge, April 21. *J. W. V. Taylor.*
Ulmus suberosa	Common Elm, flower buds appearing February 24, flowers April 8, first leaves, April 11.
Salix caprea	Great Sallow, leaves April 13.

Populus nigra	Black Poplar, by April 18.
Betula glutinosa	Common Birch, April 17. *R. H. Brown.*
Fagus Sylvatica	Beech, first leaves April 18; some in full leaf April 22; flower buds April 24. *J. W. V. Taylor.*
* Castanea vulgaris	Leaf buds April 21. *J. W. V. Taylor.*
Quercus Robur	Oak, Flower and young leaf, April 24. *J. Pole,* Leaf April 26. *Mrs. Blake.*
Corylus Avellana	Hazel, leaf April 27; nuts well formed April 30. *G. F. Buck.*
CARPINUS BETULUS	Hornbeam, April 17. *R. H. Brown.*
Taxus Baccata	Yew, April 27. *T. E. Maclean.*
Larix Europæa	Larch, April 17. *J. Pole.*
* Paris quadrifolia	Herb Paris, April 27.
Orchis Morio	Green-winged Orchis, April 29. *A. Marshall.*
O. mascula	Early Purple Orchis, April 24. *H. A. Evans.*
* Leucojum æstivum	Summer Snowflake, April 16, nearly over April 29.
Narcissus Pseudo-narcissus,	Daffodil, appearing above ground February 20; flower buds April 1; over by April 20.
* N. poeticus	April 18.
* Asparagus	In a garden near Marlborough, no traces of shoots on April 11; stems 3 inches high on April 14; and 6 inches on the 16th.
* Convallaria majalis	Lily of the Valley, nearly out by May 1.
* Tulipa sylvestris	Tulip, April 27.
* Fritillaria meleagris	Snake's-Head, by April 16.
* F. imperialis	Crown Imperial, April 17.
* Allium molle	April 25.
Endymion nutans	Blue-bell, April 16. *W. E. Bolland.*
* Muscari racemosum	Grape Hyacinth, April 16.
Colchicum autumnale	Meadow Saffron, seed by May 1.
Luzula pilosa	Hairy Wood-rush, seed April 29. *J. W. Whitaker.*
L. campestris	Field Wood-rush, April 14. *W. E. Bolland.*
Arum maculatum	Cuckoo-pint, just appearing above ground Feb. 20; spathes by April 20; spathes open April 26.
Carex præcox (?)	Vernal sedge, April 26. *A. Marshall.*
C. paludosa	River Sedge, April 23. *R. B. Mainwaring.*
C. riparia	Great River Sedge, April 23. *J. W. V. Taylor.*
Anthoxanthum odoratum	Sweet Vernal-Grass, April 22. *J. Pole.*
Alopecurus pratensis	Fox-tail Grass, April 22. *J. Pole.*
Poa annua	Annual Meadow Grass, April 23. *R. B. Mainwaring.*
P. nemoralis	April 30.
* Serrafalcus mollis	Soft Brome Grass, panicle appearing April 25. *J. Pole.*

	Rye, April 29. *J. W. Parrington.*
* Equisetum arvense ...	Corn Horse-tail, fertile frond April 23. *J. W. V. Taylor*; barren, April 29. *R. R. P. Hilton.*
Lastrea Filix-mas	Male fern, frond 11 inches long, April 29. *A. Marshall.*
Asplenium Ruta-muraria	Wall Rue, frond April 22. *A. Marshall.*
Scolopendrium vulgare ...	Hart's Tongue, frond April 12. *A. C. Almack.*
Blechnum boreale	Hard Fern, no new frond April 20. *A. C. Almack.*
Pteris aquilina	Brakes, frond 5 inches high April 21.
Botrychium lunaria ...	Moonwort, above ground April 19. *E. Lloyd.* 1¼ inches high April 30. *W. Howard.*
Ophioglossum vulgatum	Adder's Tongue, frond May 2nd. *A. Marshall.*

MAY, 1865.

* Adonis autumnalis ...	Pheasant's Eye, May 17.
RANUNCULUS DROUETTII	Well out by May 25. *E. R. Berkeley.*
R. peltatus	... ... May 13. *H. W. Hockin.*
R. acris	Upright Crowfoot, May 8.
R. repens...	Creeping Crowfoot, May 8.
R. arvensis	Corn Crowfoot, May 17. *P. S. Robinson.*
R. parviflorus	Small-flowered Crowfoot, May 25; may have been earlier.
Papaver Argemone... ...	Long Prickly-headed Poppy, May 23. *P. S. Robinson.*
P. Rhœas	Common Red Poppy, buds nearly out May 25. *J. Pole.*
P. dubium	Smooth Long-headed Poppy, by May 25.
P. LECOQII	... ... May 25. *G. F. Ruck.*
Sisymbrium officinale ...	Hedge Mustard, May 4. *H. A. Evans.*
* Armoracia rusticana ...	Horse Radish, by May 11.
Lepidium campestre ...	Pepper-wort, flower and seed May 17. *R. R. P. Hilton.*
* Isatis tinctoria...	Woad, May 18.
Reseda lutea	Wild Mignonette, May 22. *J. W. Whitaker.*
Helianthemum vulgare ...	Rock Rose, May 19. *R. B. Mainwaring.*
Silene inflata	Bladder Campion, nearly out May 25. *W. W. Melville.*
Lychnis Flos-cuculi ...	Ragged Robin, May 23. *J. Pole.*
L. vespertina	White Campion, May 13. *A. Marshall.*
Sagina procumbens... ...	Pearlwort, by May 31. *A. Marshall.*
Mœhringia trinervis ...	Three-nerved Sandwort, May 3. *H. A. Evans.*
Arenaria serpyllifolia ...	Thyme-leaved Sandwort, flower and seed June 3. *J. Pole.*

Stellaria graminea	Lesser Stitchwort, May 23. *P. S. Robinson.*
* Dianthus barbatus	Sweet William, May 31.
Cerastium triviale	Narrow-leaved Mouse-Ear, May 7. *J. W. V. Taylor.*
Malva sylvestris	Common Mallow, May 28. *G. F. Ruck.*
Tilia parvifolia	Lime, still in bud May 31.
* Geranium phæum	Dusky Geranium, May 8.
G. pratense	Meadow Crane's-Bill, May 25. *W. W. Melville.*
G. dissectum	Dove's-Foot, May 17. *P. S. Robinson.*
* G. sylvaticum	Wood Crane's-Bill, by May 18.
* G. sanguineum	Bloody Crane's-Bill, May 25.
Linum catharticum	Mil-Mountain, May 25. *R. R. P. Hilton.*
Euonymus Europæus	Spindle-Tree, May 16. *J. W. V. Taylor.*
Rhamnus catharticus	Buckthorn, May 28. *R. R. P. Hilton.*
GENISTA ANGLICA	Petty Whin, May 22. *J. Pole.* Out some days.
Sarothamnus scoparius	Broom, by May 17. *R. R. P. Hilton.*
Trifolium repens	Dutch Clover, May 13. *E. Eyre & A. Marshall.*
T. minus	Lesser Hop Trefoil, by May 25. *H, W. Hockin.*
* T. incarnatum	Scarlet Clover, May 8. *R. R. P. Hilton.*
Lotus corniculatus	Bird's Foot Trefoil, May 10. *A. Marshall.*
Anthyllis vulneraria	Lady's Fingers, by May 23 at Stonehenge, *J. Bourdillon*; by June 3 at Marlborough, *T. E. Maclean.*
Lathyrus pratensis	Everlasting Tare, May 31. *W. W. Dayman.*
Vicia hirsuta	Hairy Tare, flower and seed June 3. *J. W. Whitaker & E. W. Estcourt.*
Hippocrepis comosa	Horse-shoe Vetch, May 13. *T. E. Maclean.*
Onobrychis sativa	Cock's-Head, May 19. *A. Marshall.*
* Acacia Sp.	In bud May 26, *J. Pole*; full flower June 3. *A. Marshall.*
* Cytisus Laburnum	Laburnum, May 5. *W. W. Dayman.*
Sanguisorba officinalis	Great Burnet, May 13. *R. R. P. Hilton.*
Alchemilla vulgaris	Lady's Mantle, May 3. *A. Marshall.*
Potentilla anserina	Silver Weed, May 12.
P. reptans	Five-leaved Grass, May 24. *R. R. P. Hilton.*
Rubus Idæus	Raspberry, May 25. *R. R. P. Hilton.*
R. cæsius	Dewberry, May 21. *R. R. P. Hilton.*
Rosa canina	Dog Rose, May 22. *A. Marshall.*
R. arvensis	Trailing Dog Rose, May 24. *R. R. P. Hilton.*
Cratægus Oxyacantha	Hawthorn, May 7. *C. M. Bevan.*
* Pyrus aucuparia	Mountain Ash, May 6.
Bryonia dioica	Red Bryony, May 26, at White Horse, *Rev. E. H. Fisher.* Not until June near Marlborough.
* Philadelphus coronarius	Syringa, May 30.
Sanicula Europæa	Wood Sanicle, May 3. *J. Pole.*

* Ægopodium Podagraria	Goat Weed, by May 24.
Bunium flexuosum	Pig Nut, May 12. *J. H. Lambert.*
* Bupleurum falcatum	Hare's-Ear, nearly out May 1.
ŒNANTHE FLUVIATILIS	River Water Dropwort, leaf May 23. *J. Pole.*
Æthusa Cynapium	Fool's Parsley, May 19. *R. R. P. Hilton.*
* Meum Athamanticum	Bald Money, nearly out May 1.
Heracleum Sphondylium	Hog Weed, May 3. *R. R. P. Hilton.*
Chærophyllum temulum	Rough Chervil, May 26.
Sambucus nigra	Elder, May 8. *J. W. V. Taylor.*
Viburnum Opulus	Guelder Rose, barren flower, May 25. *G.F. Ruck.* fertile ditto, May 28. *M. O. Alison.*
* Lonicera Caprifolium	Honeysuckle, May 11. *C. M. Bevan.*
Asperula odorata	Woodruff, May 3. *P. Thursby.*
Galium Aparine	Cleavers, May 3. *T. E. Maclean.*
G. saxatile	Smooth Heath Bedstraw, May 23. *J. Pole.*
Valeriana dioica	Marsh Valerian, May 10. *W. G. North.*
Anthemis arvensis	Corn Chamomile, May 26.
Achillæa Millefolium	Yarrow, May 23. *L. C. Calley.*
Chrysanthemum Leucanthemum,	Ox-Eye, May 12.
Matricaria inodora	Corn Chamomile, May 28. *G. F. Ruck.*
Cineraria campestris	Field Fleawort, by May 23, at Stonehenge. *H. A. Evans.*
Carduus crispus	Welted Thistle, May 20. *R. R. P. Hilton.*
C. palustris	Marsh Thistle, May 30. *P. Thursby.*
Hypochæris radicata	Cat's Ear, May 23. *P. S. Robinson.*
Apargia hispida	Hawkbit, May 28. *R. R. P. Hilton.*
Sonchus asper	Sow Thistle, May 9, *A. Marshall.* Next flower observed May 28. *G. F. Ruck.*
Crepis virens	Smooth Hawk's-beard, May 23. *R. R. P. Hilton.*
Hieracium Pilosella	Creeping Mouse-Ear, May 21. *A. Marshall.*
Ilex Aquifolium	Holly, May 11. *J. W. Parrington.*
MENYANTHES TRIFOLIATA	Bog Bean, well out by May 26. *E. R. Berkeley.*
Convolvulus arvensis	Field Bindweed, May 28. *G. F. Ruck.*
Cynoglossum officinale	Hound's Tongue, May 13. *H. W. Hockin.*
* Borago officinalis	Borage, by May 17.
Myosotis versicolor	Yellow and Blue Scorpion Grass, May 25.
Solanum Dulcamara	Bitter-Sweet, May 23. *J. Pole.*
* Atropa Belladonna	Deadly Nightshade, May 24.
Linaria Cymbalaria	Ivy-leaved Toad-flax, by May 11.
Melampyrum pratense	Yellow Cow-Wheat, May 23. *J. Pole.*
* Antirrhinum... Sp.	Snap Dragon, May 31.
Pedicularis sylvatica	Red Rattle, May 5. *E. Lloyd.*
Rhinanthus Crista-galli	Yellow Rattle, May 23. *R. C. Davis.*
Veronica Beccabunga	Brooklime, May 13. *W. W. Dayman.*
V. arvensis	Wall Speedwell, in seed by May 25. *H. W. Hockin.*

* Salvia Verbenaca	Wild Sage, May 14.
Thymus Serpyllum ...	Wild Thyme, fully out in a warm spot May 11, *G. T. Spankie.* Not observed elsewhere before June.
Plantago media	Lamb's Tongue, May 23. *J. Pole.*
Rumex Acetosella... ...	Sheep's Sorrel, by May 25.
Polygonum Bistorta ...	Snakeweed, by May 28. *R. C. Davis.*
Urtica urens...	Small Nettle, May 13. *W. R. Carles.*
U. dioica	Common Nettle, buds as early as May 15. *W. W. Dayman.*
* Juglans regia	Walnut, by May 4. *A. Marshall.*
* Castanea vulgaris	Sweet Chestnut, in bud May 23. *J. Pole.*
Tamus Communis ...	Black Bryony, May 28. *P. S. Robinson.*
Orchis ustulata	Dwarf Dark-winged Orchis, by May 23. *O. Ilbert.*
O. maculata	Spotted Hand Orchis, May 23. *R. C. Davis.*
O. *latifolia*	Marsh Orchis, May 25. *W. W. Melville.*
Habenaria chlorantha ...	Butterfly Orchis, buds nearly out May 11. *A. Marshall.*
Listera ovata...	Tway-Blade, May 24. *E. Lloyd.*
Neottia Nidus-avis ...	Bird's-nest Orchis, May 19. *E. W. Collinson.*
Iris Pseud-acorus	Yellow Iris, May 27. *W. G. North* and *J. B. Bourdillon.*
Polygonatum multiflorum	Solomon's Seal, May 13. *W. R. Carles.*
* Ornithogalum umbellatum	Star of Bethlehem, May 9.
Allium ursinum	Ramsons, by May 20.
Carex divulsa	Grey Sedge, by May 20.
C. glauca	Glaucous Sedge, May 3. *T. E. Maclean.*
C. sylvatica	Wood Sedge, by May 13.
Alopecurus agrestis ...	Black Grass, May 1. *J. W. V. Taylor.*
Milium effusum	Millet Grass, May 3. *J. Pole.*
Holcus mollis	Soft Grass, by May 25.
Avena pubescens	Downy Oat Grass, May 12. *J. W. V. Taylor.*
Arrhenatherum avenaceum	Oat Grass, May 29.
Kœleria cristata	Crested Hair Grass, May 26.
Melica uniflora	Melic, by May 13.
Poa trivialis	Rough Meadow Grass, by May 25.
P. pratensis	Common Meadow Grass, May 7. *R. B. Mainwaring.*
Briza media	Quaking Grass, May 22. *A. Marshall.*
Dactylis glomerata ...	Cock's-foot Grass, May 8. *J. W. V. Taylor.*
Festuca ovina	Sheep's Fescue Grass, May 2.
Bromus erectus	Upright Brome Grass, May 27. *Mrs. Blake.*
B. Sterilis	Barren Brome Grass, May 7. *J. W. V. Taylor.*
Serrafalcus racemosus ...	Smooth Brome Grass, by May 26.
S. Commutatus ...	... ...May 25.

S. mollis	Soft Brome Grass, May 7. *J. W. V. Talyor.*
Lolium perenne	Red Darnel, May 8. *R. R. P. Hilton.*
Barley in ear	May 19. *R. R. P. Hilton.*
LASTREA OREOPTERIS	Mountain Fern, May 23. *J. Pole.*
Polystichum aculeatum	Prickly Shield Fern, frond 18 inches high, May 16. *G. A. Hight.*

JUNE, 1865.

Thalictrum flavum	Meadow Rue, June 19. *E. Lloyd.*
Ranunculus flammula	Spearwort, June 12. *R. R. P. Hilton.*
Aquilegia vulgaris	Columbine, by June 11. *Mrs. Blake.*
Papaver Rhœas	Red Poppy, June 3. *J. Pole.*
* P. somniferum	White Poppy, June 10.
Nasturtium officinale	Water Cress, by June 3. *J. W. Whitaker*, and *E. W. Estcourt.*
Arabis hirsuta	Hairy Rock Cress, flower and seed, June 7.
Sinapis alba	White Mustard, by June 5. — *Beart.*
Raphanus Raphanistrum	Jointed Charlock, June 27. *P. Thursby.*
Reseda Luteola	Weld, June 10.
* Cucubalus bacciferus	June 27.
Silene inflata	Bladder Campion, June 3. *J. Pole.*
Lychnis Githago	Corn Cockle, June 7. *Mrs. Blake.*
Arenaria serpyllifolia	Thyme-leaved Sandwort, flower and seed June 3. *J. Pole.*
Malva moschata	Musk Mallow, June 21. *A. Marshall.*
M. rotundifolia	Dwarf Mallow, flower and seed, June 18. *T. E. Maclean.*
Tilia parvifolia	Lime, June 26. *T. E. Maclean.*
Hypericum perforatum	St. John's-Wort, June 25. *Forrester.*
H. hirsutum	Hairy St. John's-Wort, June 19. *W. W. Melville.*
Geranium columbinum	Long-stalked Crane's-Bill, June 15. *E. S. Garnier.*
ONONIS CAMPESTRIS	Rest-harrow, June 26. *L. C. Calley.*
Trifolium procumbens	Hop Trefoil, June 15 (out some days).
Anthyllis vulneraria	Lady's Fingers, by June 3. *T. E. Maclean.*
Vicia hirsuta	Hairy Tare, flower and seed, June 3. *J. W. Whitaker.*
V. TETRASPERMA	Slender Tare, flower and seed, June 7. *J. W. Whitaker*, at Mildenhall; also by *R. R. P. Hilton*, June 7, on the top of White Horse Down.
V. sylvatica	Wood Vetch, June 7. *J. Pole.*
V. Cracca	Tufted Vetch, June 12. *R. R. P. Hilton.*
V. Sativa (var. angustifolia)	Common Tare, flower and seed, June 7.

Spiræa Ulmaria	Meadow-sweet, June 14, *L. C. Calley,* and *P. Thursby.*
S. Filipendula	Common Dropwort, nearly out June 7, *T. E. Maclean*; fully out June 18, *E. A. King.*
Agrimonia Eupatoria	Agrimony, by June 7.
Fragaria Vesca	Strawberry, fruit June 7.
ROSA MICRANTHA	Small-flowered Sweet Briar, June 11. *M. O. Alison.*
Epilobium montanum	Broad Willow-Herb, June 5.
Circæa lutetiana	Enchanter's Nightshade, about June 26.
Bryonia dioica	Red Bryony, June 1. *P. Thursby.*
Sedum acre	Stonecrop, June 10.
Pastinaca sativa	Parsnep, June 27. *R. R. P. Hilton.*
Daucus Carota	Wild Carrot, June 12.
Torilis Anthriscus	Hedge Parsley, in bud June 12. *R. R. P. Hilton.*
Cornus sanguinea	Dog-wood, June 4. *H. R.* and *J. W. Parrington.*
Lonicera Periclymenum	Honeysuckle, June 12. *R. R. P. Hilton.*
* Symphoricarpus racemosa	Snowberry, June 5. *J. Pole.*
Asperula cynanchica	Quinancy-wort, by June 3. *H. R. Parrington.*
Galium Mollugo	Great Bastard Madder, June 14. *R.R.P.Hilton.*
G. verum	Lady's Bedstraw, June 19. *W. W. Melville.*
Valeriana officinalis	Valerian, June 7. *J. Pole.*
Knautia arvensis	Field Scabious, June 7. *E. H. Davis.*
Scabiosa Columbaria	Small Scabious, June 7. *R. R. P. Hilton.*
Eupatorium cannabinum	Hemp Agrimony, nearly out June 27.
Matricaria Parthenium	Feverfew, June 13.
Filago germanica	Cudweed, June 10. *R. R. P. Hilton.*
Senecio Jacobæa	Ragwort, June 14. *H. A. Evans.*
S. aquaticus	Marsh Ragwort, June 4. *J. Pole.*
Arctium majus	Burdock, nearly out June 26. *T. E. Maclean.*
Centaurea nigra	Black Knapweed, June 7. *R. C. Davis.*
C. Scabiosa	Great Knapweed, June 7.
Carduus nutans	Musk Thistle, nearly out June 3; *T. E. Maclean* and *P. Thursby.* Well out by June 12.
C. arvensis	Creeping Thistle, by June 12.
C. acaulis	Ground Thistle, June 11. *M. O. Alison.*
* Silybum marianum	Milk Thistle, about June 14.
Lapsana communis	Nipplewort, June 15. *W. W. Melville.*
Sonchus oleraceus	Sowthistle, June 27. *P. Thursby.*
S. arvensis	Corn Sowthistle, full bud June 12.
TRAGOPOGON MINOR	Goat's-beard, June 3; *J. Pole.* Found frequently since that date.
* S. alpinus	Blue Sowthistle, June 25.
Campanula glomerata	Clustered Bell-flower, June 25. *R. B. Mainwaring.*

* C. latifolia	Giant Bell-flower, June 20.
* C. rapunculoides	Creeping Bell-flower, June 26.
C. rotundifolia	Hairbell, June 18. *A. T. Rickards.*
Ligustrum vulgare	Privet, June 12. *J. W. Whitaker.*
* Jasminum	Jasmin, June 15. *A. Marshall.*
Erythæa Centaurium	Centaury, June 16. *A. Marshall.*
Convolvulus sepium	Great Bindweed, June 24. *G. F. Ruck.*
* Symphytum asperrimum	by June 12.
Myosotis palustris	Forget-me-not, June 3. *J. Pole.*
ECHIUM VULGARE	Viper's Bugloss, by June 18. *W. Howard.*
* Solanum tuberosum	Potato, June 6. *R. R. P. Hilton.*
HYOSCYAMUS NIGER	Henbane, by June 4, *J. Pole*, at Preshute; by June 16, *E. H. Dairs*, on Forest Hill.
Orobanche minor	Lesser Broom-rape, by June 19. *R.R.P.Hilton.*
O. ELATIOR	Tall Broom-rape, by June 23. *R. R. P. Hilton.*
Verbascum Thapsus	Great Mullein, June 11. *H. R. Parrington.*
* Digitalis pupurea	Foxglove, about June 3.
Linaria minor	Calf's-snout, June 5.
L. vulgaris	Yellow Toad-flax, June 6. *A. C. Almack*, and — *Bolland.* Not generally out till June 14.
Scrophularia nodosa	Knotted Figwort, June 2. *P. Thursby.*
S. aquatica	Water Betony, June 8. *J. Pole.*
MIMULUS LUTEUS	Mimulus, by June 11. *R. C. Davis*; (an escape from some garden.)
Euphrasia Odontites	Red Bartsia, June 16. *R. R. P. Hilton.*
Veronica officinalis	Common Speedwell, June 12. *R. R. P. Hilton.*
Thymus Serpyllum	Wild Thyme, June 3. *A. P. Hockin*; not generally out before this date.
Prunella vulgaris	Self-heal, June 11. *R. R. P. Hilton.*
Galeopsis Ladanum	Ironwort, June 18. *R. B. Mainwaring.*
Stachys Betonica	Wood Betony, June 22. *A. Marshall.*
S. sylvatica	Hedge Woundwort, June 3. *T. E. Maclean*, and *P. Thursby.*
VERBENA OFFICINALIS	Vervain, June 27.
* Lysimachia Nummularia	Money-wort, about June 17.
L. nemorum	Yellow Pimpernel, June 6. *W. R. Carles.*
Anagallis arvensis	Scarlet Pimpernel, June 20.
Plantago major	Way-bread, by June 7.
Rumex conglomeratus	Sharp Dock, June 20. *G. F. Ruck.*
R. sanguineus	Red-veined Dock, June 18. *P. Thursby*, and *L. C. Calley.*
R. obtusifolius	Broad-leaved Dock, June 7.
R. crispus	Curled Dock, June 7.
Polygonum Persicaria	Spotted Persicaria, June 10.

P. aviculare	Knot-grass, June 15.
P. convolvulus	Black Bindweed, June 7.
Urtica dioica	Common Nettle, by June 6, (perhaps earlier).
Gymnadenia conopsea	Red-handed orchis, June 5. *H. A. Evans*; in Clatford Vale. Also in Chalk Pit by Pewsey-road, by *R. R. P. Hilton.*
CEPHALANTHERA GRANDIFLORA	Large white Helleborine, by June 7. *J. Pole.*
Epipactis latifolia	A young specimen, probably of this species, was found in West Woods by *A. Marshall.*
Juncus glaucus	Hard Rush, in bud June 18. *L. C. Calley* and *T. E. Maclean.*
Alisma Plantago	Water Plantain, June 24. *L. C. Calleg.*
Sparganium ramosum	Bur-reed, June 24. *L. C. Calley.*
S. Simplex	Upright Bur-reed, June 25. *J. W. Whitaker.*
Eleocharis palustris	Creeping Spike-rush, by June 18. *L. C. Calley* and *P. Thursby.*
PHALARIS CANARIENSIS	Canary-grass, June 16. *L. E. Walters*; not truly wild.
P. arundinacea	Great Reed-grass, June 4. *J. Pole.*
Phleum pratense	Timothy Grass, June 4. *J. Pole.*
Alopecurus geniculatus	Floating Fox-tail Grass, June 12.
Aira cæspitosa	Hair Grass, in bud June 7; not generally so.
Trisetum flavescens	Yellow Oat-grass, June 5. *J. Pole.*
Glyceria aquatica	Great Water Reed-grass, June 18. *J. W. Whitaker*, and *T. R. Went.*
G. plicata	Flote-grass, June 4. *J. Pole.*
Cynosurus cristatus	Dog's-tail Grass, June 3. *J. Pole.*
Festuca rubra	Creeping Fescue-grass, June 5. *J. Pole.*
Bromus Asper	Rough Brome-grass, June 7.
TRITICUM CANINUM	Fibrous-rooted Wheat-grass, June 12.
T. repens	Couch-grass, June 9.
* Lolium Italicum	Italian Rye-Grass, by June 3. *R. R. P. Hilton.*
Wheat in ear	June 7. *Mrs. Blake.*
Oats in ear	June 12. *R. R. P. Hilton.*
Equisetum limosum	Smooth Naked Horse-tail, June 5. *J. Pole.*

BIRDS.

Unless stated to the contrary, the dates given are those on which the first eggs were taken, which, in most cases, are probably the first eggs laid this year.

MARCH, 1865.

Hirundo rustica	Swallow, seen March 28. *E. G. Bevan.*
Columba palumbus	Ring-dove, eggs March 10, young birds March 22. *J. H. Lambert.*

APRIL, 1865.

Falco tinnunculus	Kestrel, April 21. *J. W. Parrington.*
Falco nisus	Sparrow Hawk, April 26. *Lawson.*
Syrnium stridula	Tawny Owl, April 12. *J. Pole.*
Lanius collurio	Red-backed Shrike, seen April 10. *J. Pole.*
Turdus viscivorus	Missel Thrush, April 8. *W. R. Carles.*
Turdus musicus	Song Thrush, April 3. *W. W. Melville.*
Turdus merula	Blackbird, April 10. *E. H. Carr.*
Turdus torquatus	Ring Ouzel, seen April 16. *A. Armstrong, Esq.*
Accentor modularis	Hedge Sparrow, April 12. *W. Blaker.*
Erythaca rubecula	Redbreast, April 11, (hard set). *P. S. Robinson.*
Phœnicura ruticilla	Redstart, April 28. *R. C. Davis.*
Parus major	Great Tit, April 27. *R. C. Davis.*
Parus cœruleus	Blue Tit, April 24. *R. C. Davis.*
Parus caudatus	Long-tailed Tit, April 24. *G. A. Wright.*
Motacilla Yarrellii	Pied Wagtail, April 27. *W. Ward.*
Alauda arvensis	Sky Lark, April 20. *J. W. Parrington.*
Emberiza citrinella	Yellow-hammer, April 17. *W. W. Melville.*
Fringilla cælebs	Chaffinch, April 15. *W. W. Melville.*
Passer domesticus	House Sparrow, April 17. *W. W. Melville.*
Linota cannabina	Common Linnet, April 26. *E. H. Davis.*
Sturnus vulgaris	Starling, April 24. *L. C. Calley.*
Corvus monedula	Jackdaw, April 11. *J. Pole.*
Pica caudata	Magpie, April 8. *H. W. Hockin.*
Garrulus glandarius	Jay, April 26. *P. S. Robinson.*
Certhia familiaris	Common Creeper, April 28. *R. C. Davis.*
Sitta europæa	Nuthatch, April 28. *R. C. Davis.*
Cuculus canorus	Cuckoo, heard April 8, *H. W. Hockin.* Seen April 12, *P. S. Robinson.*
Hirundo rustica	Swallow, April 2. *E. G. Bevan.*
Cypselus apus	Swift, seen April 27. *H. W. Hockin.*
Columba œnas	Stock Dove, April 11. *R. C. Davis.*
Vanellus cristatus	Peewit, eggs (hard set), April 20. *J. W. Parrington.*
Crex pratensis	Land Rail, heard April 26. *H. P. Lee.*
Gallinula chloropus	Moorhen, April 13. *P. S. Robinson.*
Podiceps minor	Dabchick, April 29. *J. W. Whitaker.*
Larus argentatus	Herring Gull, seen April 23. *W. R. Carles.*

MAY, 1865.

Falco nisus	Sparrow Hawk, in Savernake Forest, May 16. *Goldsmidt.*
Lanius colurio	Red-backed Shrike, May 27, *Chadwick.* May 22, *P. S. Robinson.*
Muscicapa griseola	Spotted Flycatcher, seen May 19. *P. S. Robinson.* Eggs on the 23rd, at Marden, *W. Blaker.*

Saxicola rubetra	Whin Chat, May 27. *H. R. Parrington.*
Salicaria locustella	Grasshopper Warbler, May 23. *W. Blaker.* Three more nests taken.
Salicaria phragmitis	Sedge Warbler, May 12 (with Cuckoo's egg.) *W. C. Blaker.*
Curruca hortensis	Garden Warbler, May 26. *E. H. Carr.*
Curruca cinerea	Common Whitethroat, May 2. *Back* and *Chester.*
Curruca sylviella	Lesser Whitethroat, May 13. *J. W. Harrison.*
Sylvia sylvicola	Wood Wren, May 26. *E. H. Carr.*
Sylvia trochilus	Willow Warbler, May 14. *J. W. Parrington.*
Regulus cristatus	Golden-crested Wren, May 13. *W. Howard.*
Anthus arboreus	Tree Pipit, May 23. *H. R. Parrington.*
Anthus pratensis	Meadow Pipit, May 13 (six eggs). *P.S.Robinson.*
Alauda arborea	Wood Lark, May 5 (hard set). *E. H. Carr.*
Emberiza schœniclus	Black-headed Bunting, May 5. *R. R. P. Hilton.*
Coccothraustes chloris	Greenfinch, May 3. *R. C. Davis.*
Coccothraustes vulgaris	Hawfinch, May 3. *H. F. Boyd* and *E. H. Carr.* Two more nests taken afterwards, May 15, *E. Edgell* and *E. A. King.*
Carduelis elegans	Goldfinch, May 13. *E. H. Carr.*
Linota linaria	Lesser Redpole, about May 10. *E. Lloyd.*
Pyrrhula vulgaris	Bullfinch, May 7. *J. Bourdillon.*
Corvus corone	Carrion Crow, May 12. *P. Aldworth,* and *S. M. Hammick.*
Troglodytes vulgaris	Common Wren, May 3.
Cuculus canorus	Cuckoo, young, May 3, *W. W. Dayman.* Egg, May 11. *J. W. Whitaker.*
Hirundo riparia	Sand Martin, May 23. *H. R. Parrington.*
Caprimulgus europæus	Night-jar, seen May 2. *P. S. Robinson.* Egg, May 31. *Bennett.*
Columba turtur	Turtle Dove, May 30. *E. H. Davis.*
Phasianus colchicus	Pheasant, May 23. *E. G. Baggallay.*
Perdix cinerea	Partridge, May 23. *P. S. Robinson.*
Crexpratensis	Land-rail, May 26. *H. W. Hockin.*
Fulica atra	Common Coot, May 31. *P. Aldworth.*

JUNE, 1865.

Otus vulgaris	Long-eared Owl, June 5. *H. R. Parrington.*
EMBERIZA CIRLUS	Cirl Bunting, June 4. *E. L. Bernays.*
Emberiza miliaria	Common Bunting, two nests, June 20. *E. R. Berkeley.*
Cypselus apus	Swift, June 9. *E. H. Carr.*
Anas boschas	Wild Duck, June 3. *F. C. Lightfoot.*

A short Summary of Observations of the Weather during the past six months will be a useful record, and probably not wanting in interest.

January opened with frosty weather, but on the 4th the temperature rose, and continued moderately high till the 17th, when it fell considerably, reaching its *minimum* on the 29th, on which day it was as low as 5·8°, very nearly the lowest recorded reading in England. (It was 5·0° at Lampeter, and 5·7° at Banbury). A slightly warmer period then set in till the 8th of February. From the 8th to the 17th was a very cold period, being coldest on the 12th. The temperature then rose till the 23rd, but from that date till the end of March it kept continually decreasing.

March, especially, was a cold month. As a rule, the mean temperature of February ought to be 2·0°, and of March 5·0°, higher than that of January. This year the mean temperature of January was 3·3° below the average for England; that of February only 0·8° above that of January; and that of March only 0·4° above that of February.

There was a moderate amount of snow, which in some measure compensated for the small amount of rain last year. It fell on 17 days during the three months, though on some of them the amount was exceedingly small.

The wind during this time was, as a rule, very slight. It blew strongly on the 12th and 13th of January; the 18th, 19th, and 28th of February; from the 2nd to the 6th, and from the 19th to the 22nd of March; at all other times it was always light, and in some instances almost inappreciable.

In consequence, therefore, of this cold period, vegetation was much impeded; and, as a rule, we were about a month behind-hand at the end of March.

The weather during the month of April was especially remarkable, varying in every particular from that of ordinary years. The most remarkable point was the temperature. After the bitter cold of March, when the maximum thermometer never registered so much as 50°, except on the last day, (when it reached nearly 52°), it was curious to observe how immediately the temperature rose, as soon as April began. The maximum temperature was very variable, but it was never so low as 50°; on no less than nine days it was over 70°, though on the 15th and 19th it fell to below 54°.

The daily range of temperature was still more remarkable.—On the hottest day of the month the range was no less than 42°; whereas on the 19th it was only 2½°. This may be easily accounted for by the amount of cloud. On the very hot days there was scarcely any cloud, and consequently at night the earth lost a considerable amount of heat by radiation, so much so that on those nights there was generally a white frost. On the 19th, the whole sky was overcast, and the heat of the earth was therefore partially maintained by counter-radiation from the clouds. This unusually small amount of cloud during the month was of great use to the earth, remedying, in a certain degree, the excessive want of rain; for on the evenings of the very hot days, there was a copious dew, and vegetation, therefore, took a great start under the combined effects of heat and moisture.

As regards the amount of rain, it was so small that unless there be a great deal later on in the year, there will be as dry a year as 1864,—the driest on record.

The variation of the Barometer has been remarkably small; the difference between the readings at 8.45 a.m., on two consecutive days, being sometimes not so much as ·005 of an inch.

There was also a remarkably small amount of wind. It was frequently a matter of considerable difficulty to decide in what direction the wind really blew; for while the smoke gave evidence that there was *some* wind, the weathercocks were all so rigid or heedless that they pointed in every possible direction but the right one.

It is worthy of remark that till half-past 6 o'clock on Friday evening (April 28th), this calmness of the air continued; at that time the wind suddenly rose in gusts, and continued to blow strongly for the rest of the month.

In May the weather was not very different from what it was last year. The temperature, with but few exceptions, kept on increasing till the 21st, when it fell slightly; the 10th and 11th were cool, but without much wind. Though the *maximum* this year was only 78·0° against 82·0° last year, yet as there were no frosty nights, the mean temperature was 0·1° higher, an extremely small difference however. On the 10th and 11th, from the amount of cloud, there was but a very small range of temperature during the day, it being only 3·2° on the 10th, and 5·2° on the 12th.

May was a rainy month, the fall being 2·6 inches, or 0·5 inch above the average. The month being free from frosts, vegetation progressed, and plants showed good signs of a plentiful supply of fruit.

The amount of cloud and wind was large—the wind was generally high, but from the 27th to the 30th it was very strong.

In June the temperature was very high, reaching a *maximum* of 88·7° in the shade on the 21st. Excepting on the 2nd and 30th, the *maximum* was never below 64·0°, whilst the *minimum* was hardly ever below 40·0°, consequently the range of temperature was not very remarkable, though it was as much as 50·3° on the 21st. The mean temperature for the month was 59·8°, very high for June.

The Barometer was very high during the whole month, with the exception of the few first and last days, but even taking these into account, the mean height was 29·74 inches.

The amount of wind was again exceedingly small; from the 5th to the 12th it was strong at times, and also on the 24th and 25th, but the mean amount for the month was not more than that for April. There were no less than five cloudless days in June, and as there was little or no wind on those days, the heat was very oppressive.

Notwithstanding the fine weather, the want of rain has been severely felt. On the 1st and 2nd 0·75 inches of rain fell, but the following interval up to the 29th was a very dry period, consequently the fruit and vegetables suffered exceedingly. The peas could not form fresh flowers, and the crop was therefore very small, the peas themselves being very hard. Strawberries, too, were very inferior, and the fruit generally greatly checked, the crops being much thinned by the drought.

Mr. Glaisher, in his "Remarks on the weather, during the Quarter ending 30th of June, 1865," makes the following statement:—

"The average temperature of these three months was as high as 56½°, and there is no instance on record of such a high temperature. The nearest approaches to this value were 55°·5 in 1775, 55°·1 in 1844, 55°·7 in 1846, and 55°·3 in 1848."

"The temperature in April was remarkable indeed; there is no instance on record of one so warm. The nearest approach to this high temperature was in 1844, when it was 51°·7; the next was in 1821, viz., 50°·4; and the only other instance, back to 1771, in which the mean temperature exceeded 50°, viz., 50°·7, was in the year 1779."

"The usual increase in the mean temperature from March to April is about 5°. In this year, at stations south of lat. 53°, April was from 12° to 17° warmer than March; and at stations north of 53° the increase was from 8° to 10°. This great increase is very remarkable."

This being the first year of a systematic registration of the observations on Natural History by the whole School, I am unable to make many comparisons between this year and 1864, but it may be remarked that at the end of March we were about a month behind-hand. The fine April not only made up for arrears, but probably made vegetation more forward than usual. The rapidity with which the trees came into full leaf when once the buds began to swell was very remarkable. The Spring flowers, too, as daffodils, sweet violets, snowflakes, &c., lasted but a very short time.

By the first of May there were but few trees which were not more or less green. Below is a table showing the times of full leaf this year and last year:—

	1865	1864
Elm	Leaf April 11	May 15
Oak	„ April 26	April 28
Lime	„ April 29	April 29
Horse Chestnut	Flower April 25	May 1
Hawthorn	„ May 7	Flower May 15
Hazel	Leaf April 27	Leaf April 28
Beech	„ April 22	„ April 28
Field Maple	„ April 26	„ April 28
Ash Leaf and shoots three inches long	May 1	„ May 6
Lilac	Flower April 29	Flower May 5
Mealy Guelder Rose	„ April 22	„ May 4
Spanish Chestnut	Leaf buds April 21	Leaf May 9
Ranunculus Heterophyllus	Flower April 22	Flower April 30

	Mean height of Barometer.		Monthly range		Mean temperature of air		Mean daily range.		Maximum in shade.		Minimum in shade.		Maximum in Sun.		Minimum on Grass.		Mean degree of Humidity		Mean amount of Cloud.		Amount of Rain.		No. of days on which it fell.	
	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864
JANUARY	29·109	...	1·764	...	34·4	...	11.8	...	50·1	...	5·8	...	74·7	...	3·2	...	92·0	...	6·8	...	3·858	...	18	...
FEBRUARY	29·411	...	1·716	...	35·2	...	11·2	...	49·8	...	17·4	...	104·9	...	9·7	...	93·5	...	8·4	...	2·344	...	19	...
MARCH ...	29·431	29·186	1·110	1·220	35·6	40·7	13·9	14·2	51·7	58·0	21·8	18·3	110·8	...	11·8	...	81·9	86·6	8·0	...	1·206	3·273	15	16
APRIL ...	29·649	29·582	0·524	0·654	52·0	47·0	24·3	19·6	77·6	70·6	29·4	30·2	129·9	...	16·0	...	73·5	80·7	4·7	6·5	0·988	1·920	8	12
MAY	29·457	29·565	0·854	0·654	53·8	53·5	21·7	19·4	78·0	82·0	33·2	30·2	135·7	128·1	24·4	22·8	80·0	79·4	7·3	5·8	2·622	1·540	22	12
JUNE	29·740	29·500	1.280	0·778	59·8	54·6	25·1	16·1	88·7	70·3	37·5	33·1	149·0	123·0	29·0	27·2	69·5	71·0	5·4	6·2	2·827	1·631	6	18
MEAN ...	29·466	...	1.208	...	45·1	...	18·0	...	...	...	...	...	...	...	...	...	81.7	...	6·3	...	...	...	...	...

Total amount of Rain during the 6 months, 13·845 inches.

REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

FOR THE

HALF-YEAR,

ENDING CHRISTMAS, 1865.

> "Tum mihi Naturæ libeat perdiscere mores,
> Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH
Printed and Published by C. Perkins, Times Office.
1866.

D.18.12,88

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PREFACE.

Half-a-Year ago we undertook the task (an anxious and uncertain one) of trying at Marlborough an experiment up to that time untried, at any rate on the same scale, in any other public school. We ventured to lay before our own society, and the school generally, a chronicle of our recent progress, and, in short, a practical description of our aims and our doings. The manner in which our "Report" has been received, both within and far beyond the immediate circle of Marlborough, justifies a second effort, and inspires us with greater confidence in attempting it.

In our general design we have nothing new to announce; but we are unwilling to let slip this opportunity of congratulating the Society on some few noticeable features of the last half-year. We are glad to be able to state that a number of letters have been received by the President (Rev. T. A. Preston), expressing a very cordial approval of our former Report, and of the Society's system and operations, as far as they are there explained. These letters have been sent by persons well qualified to judge in Natural History matters, and some of them by men of confirmed reputation in that field of study. The encouragement which we have received from without found its latest expression in the attendance of the Rev. F. W. Farrar at our meeting on December 15th last. Mr. Farrar is the active supporter of a society at Harrow, in many respects resembling our own. He may be said, therefore, to have been present in the double capacity of a friendly and critical observer; and, judging from his interesting and thoughtful speech on the occasion of his visit, we have no reason to be dissatisfied with the results of his inspection. Within our own pale we have to express our thanks for kind encouragement received from more than one Member of the Common Room, and still further to record our deep sense of obligation to the Master.

Since our first appearance, we have all hailed the advent of our contemporary, *The Marlburian*, to whom thanks are due for a regular insertion of reports of our meetings. The details of these meetings have been rearranged on a sounder and more satisfactory principle, and the attendance has been full and steady. Notwithstanding the unfavourable time of the year, collections have been made with vigour and success, though we cannot but express a wish that the field of our operations may be extended by recruits in departments of science not yet much worked by us, more especially in geology. As usual, we owe the President a debt of gratitude not easily expressed in words. His wide knowledge, his persevering interest, his unfailing kindness, have been our stay and prop from the first.

On the whole we hope and believe that, adhering to the principles which have guided it from its foundation, and adopting cautious and well-considered provisions for the future, our Society may secure and retain the good will of all true friends of our common *Alma Mater*.

◆

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	£	*s.*	*d.*		£	*s.*	*d.*
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REPORTS.

No. of copies Printed	250	Supplied to Members	34
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		Sold	201
		No. still on hand	9
	250		250

RULES.

1.—THAT this Society be called the Marlborough College Natural History Society.

2.—That it be managed by a Committee of Five Members, and that the vacancies in the Committee be filled up by persons elected from and by Members of the Society.

3.—That, in the absence of the President, one of the Committee take the Chair at the Meetings.

4.—That the Election of New Members rest with the Committee.

5.—That any one may be elected a member of the Society, if he have attended as many meetings, and have shewn as much interest in the proceedings as the Committee shall think fit; and that the names of such New Members be read out at the next Meeting after the Election.

6.—That each Member be allowed to bring one Friend to the Meetings of the Society, and that his Friend be allowed and requested to enter into any discussion, or shew any object of interest, but be not allowed to vote on any question.

7.—That each Member be responsible for the behaviour of his Friend.

8.—That the Meetings of the Society be held once a fortnight.

9.—That the Committee be empowered to eject or suspend any Member, if, without good reason, he absent himself twice in succession from the Meetings of the Society, or be judged guilty of any serious misdemeanor at such Meetings.

10.—That any person present may exhibit objects calculated to interest the Society at their Meetings.

11.—That it be left to the Committee to determine the subjects for Lecture or discussion, and that any person may deliver a Lecture before the Society with the sanction of the Committee.

12.—That in case of an equality of votes, the casting vote lie with the President, and that he have no vote except in such a case.

13.—That a report of the proceedings of the Society be entered in a book, to be kept for that purpose by the Secretary.

14.—That the Secretary be chosen out of the Committee by the Members of the Society, and that he hold office for one half-year, but may offer himself for re-election at the commencement of the next.

15.—That any Member of the Society have power to bring forward a motion for the alteration of any Rule, provided his motion be seconded by another Member; and that the making of New Rules shall lie with the Committee, who shall not have power to alter them without the consent of the majority of the Society.

A. C. ALMACK,
HON. SEC.

February, 1866.

MEETING HELD SEPTEMBER 1st, 1865.

EXHIBITIONS :—

BY THE PRESIDENT.—Boxes of Lepidoptera, sent by Messrs. Stevens, Greene, and Brown, for the College collection. A branch of the Deadly Night-Shade (*A. Belladonna*), in fruit.

BY W. W. DAYMAN.—Lepidoptera, including *L. Sinapis*, *C. Lychnitis*, *G. Quercifolia*, etc.

BY A. MARSHALL.—Specimen of petrified Wood.

BY J. POLE.—Species of Fungus, known as the Bird's-Nest Moss (*Cyathus vernicosus*).

BY H. A. EVANS.—The following Lepidoptera; Clouded Yellow (*Colias Edusa*), Comma (*Grapta C. Album*), Humming Bird Hawk-Moth (*Macroglossa Stellatarum*), etc., taken near Chepstow.

BY H. W. HOCKIN.—Specimen of the Globe Fish.

BY J. W. WHITAKER.—Two specimens of Glanville Fritillary (*M. Cinxia*).

BY H. R. BROWN.—Series of specimens of primitive rocks.

A private meeting of the Society was then held, when A. C. ALMACK was re-elected Secretary for the ensuing half-year; it was also resolved that the meetings henceforth should be held fortnightly.

MEETING HELD SEPTEMBER 15th, 1865.

The President read a list of the most important notices obtained during the preceding fortnight.

EXHIBITIONS :—

BY THE PRESIDENT.—First specimen of the Golden Rod (*Solidago virgaurea*), found growing in the neighbourhood. Specimen of the Soapwort (*Saponaria officinalis*), in flower. Specimen of White Stonecrop (*Sedum album*), in flower, found at Poulton. Primrose in flower. Skulls of the common Pig and Babyroussa (an animal of the pig tribe found in the Molucca Islands). Skulls of two dogs, exemplifying degrees of ferocity, as shewn by the projecting ridge on the head. A Chelifer, an animal, so called from its lobster-like claws, and found attached to the legs of the House-Fly.

BY W. R. CARLES.—Specimen of broad-leaved Helleborine (*Epipactis latifolia*).

BY F. C. LIGHTFOOT.—Fossilized and Natural Sponges. Three pieces of coral.

BY J. W. WHITAKER.—The following Lepidoptera; Camberwell Beauty (*V. Antiopa*), Scarce Swallow-Tail (*P. Podalirius*), White Admiral (*L. Sibilla*), and Small Elephant (*C. Porcellus*).

By C. E. Powell.—Sea Horses (*Hippocampi*); curious Fishes, in which the male has a pouch, in which the eggs are incubated.

By H. R. Parrington.—A box of Lepidoptera.

By A. P. Hockin.—A Stag-Beetle (*L. Cervus*).

By J. Pole.—Scotch Argus Butterfly (*E. Blandina*), and Dia Fritillary (*A. Dia*).

By A. Marshall.—Specimen of *Sirex Gigas*, an Insect whose larva is particularly injurious to fir trees.

By H. A. Evans.—A fungus-like mass attached to a branch of sloe, found at Rabley Copse.

The following paper, written by J. W. Mills, a former member of the Society, was then read by W. R. Carles.

WASPS.

Naturally no one feels inclined to take as much interest in the proceedings of Wasps as in those of bees, because from bees we generally get more honey than stings, while from wasps far more stings than honey. Nor can I say that this is as pleasing an insect as the bee, but yet it has some good qualities, and is certainly far from being without its use. It seldom stings unless it is hurt or irritated; and if, when a wasp was inclined to settle on us, we would sit still, and not interfere with or irritate it, we should generally escape being stung. They are, as you all know, very bold, much bolder generally than bees; but when we learn that their boldness in stealing fruit is influenced not, as it at first appears, by greediness, but to support the young in their nests, we shall be, or ought to be, less provoked at them.

They are not as careful as bees in laying up stores for the winter; but shew quite as much ingenuity in building their houses, the construction of which requires much harder work, as at first it is all done by one insect. Unlike the queen bee, who sets out attended by thousands of workmen, who ply their tasks in the most industrious manner, and so take all the trouble on their own shoulders, the female wasp lays the foundation of her city alone and unaided. These mother wasps are generally the relics of the last year's swarms, of which far the greatest number live only one summer. There are always, however, a few survivors, which spend the winter in a torpid state, without eating or even moving. These, as I before said, become the parents of new swarms. They have however, an enormous task to perform, before a place can be got ready for the new family. The wasp begins to build in the following way:—She first makes a long winding passage under ground, about an inch in width, and about a foot and a half in length. This leads to a chamber, which she makes about as wide as the passage is long, and when this chamber is hollowed out she begins to form a compact lining for it, so that the earth may not fall in and destroy the cells. She has no *wax* like bees, with which to form cells, and therefore uses *paper* which she makes herself, as follows. She finds a piece of wood, and having gnawed a bundle of fibres out of it, carries them off to a secure place. She then softens and moistens them with a gummy kind of liquid which her mouth supplies, and kneads them up into a sort of paste. Having done this, she takes it and lines the roof of the chamber above mentioned, spreading out the little ball of paste by means of her tongue and feet, until it is almost as thin as silver paper. But this would not be strong enough if only a single sheet were applied, so she places fifteen or sixteen in layers, one upon another, till the walls are nearly two inches thick, and look like little oyster shells laid above each other. Wasps do not, like bees, build their combs perpendicularly, but horizontally, and in order to prevent the layers of comb from falling upon one another small supports are erected on each layer. These supports are made of the same material as the walls and the cells. It seems wonderful how one little creature can perform all this. But the solitary worker at last gets help. Having finished a few cells she is obliged to leave off building and collect food for the young grubs which will soon be hatched. In a few weeks they become perfect wasps, and the poor mother who has laboured so hard, has now, as she deserves, some assistance from her children, who work with her, and help in making new layers of cells for the increasing family, who collect food, and look after the young in regular succession. By the end of the summer their united efforts have finished about thirteen or fourteen of these layers, comprising altogether as many as fifteen or sixteen thousand cells, and each serves as a house not only for one wasp, but when the first has left it it is inhabited by a second and third, and sometimes even more, so that we may moderately estimate the contents of a nest at about three hundred thousand.

Besides these *ground wasps* there are *tree wasps* and *mason wasps*.

Tree wasps, as their name implies, do not dig into the ground and there form their nests, but hang them from the bough of a tree, generally choosing that of the fir. They are not so common in England as the *ground wasps*, but still they are occasionally met with. In some foreign countries where they abound, their nests have an outside covering, strong enough to resist the heavy tropical rain. They are shaped like a purse, and the entrance is by a hole underneath.

The two kinds of wasps I have mentioned are gregarious, but the *mason wasp* is a solitary individual. This insect, when requiring a nest, looks out for a brick which she thinks will suit her purpose, and then begins to cut a hole in it, by biting out little pieces about the size of a mustard seed. The hole she makes is only just large enough to admit herself, so that it is quite impossible for her to turn round and fly out, and therefore she comes out backwards. I must also mention that she is very careful to carry off with her the pieces of brick she bites off and not to leave them littering about the hole; the reason for doing this is her fear for her great enemy the cuckoo-fly, which is as great an enemy to wasps as the ichneumon is to moths. It imitates the bird from which it is named, and lays its eggs in a nest which does not belong to it. When the grubs are hatched they kill the young wasps. A wasp has been seen to drop one of these little pieces of brick on the ground, and then to look about with the greatest anxiety till she found it, whereupon she carried it off beyond the reach of danger, for fear that the cuckoo-fly might see it, and come to attack the nest. There is another kind of mason wasp which builds a house for her young in a most curious way. She begins by boring a hole two or three inches deep into a sand bank, choosing, in general, as hard a place as possible. This she softens by means of fluid from her mouth, and begins to hew into it with her jaws, which are formed in the shape of a little double pickaxe. When some of the sand is dug out, she kneads it into a little ball, and fastens it outside the entrance. She goes on digging and bringing out these balls from time to time, and placing them round the entrance above each other till she has formed a kind of tower round the hole. In doing this she works so hard that in one hour a passage has been made as long as her body, and a tower built of the same height. This tower seems to perform a double duty. It not only shelters the insect as she works, from the burning sun, but it also keeps off the mischievous cuckoo fly, which is seen flying about and occasionally prying in, but afraid to venture down the dark passage, lest the wasp should be at home and give the visitor a welcome in the shape of a good sting. The young grubs of this kind of wasp, do not, like those of bees, live on the pollen of flowers, but are provided by their careful and hard-working mother with proper food, her method affording a wonderful instance of the faculty by which the parent provides for the wants of her offspring. She collects a number of green caterpillars, and packs them above each other like a corkscrew, in such a manner that they cannot move, although they remain alive. Had they been placed otherwise, and not regularly one above another, the little grub might have devoured them all at once, or at any rate killed them, and so his food would have either been all water, or become putrid and of course of no use. The mother, too, collects only such caterpillars as are full grown, and likely to live the longest without food. If she chose younger ones they would die with hunger before the little grub was ready for them. The grubs generally pass into a chrysalis state when about a fortnight old, during the whole of which time they of course require a continual supply of food. The entrance to the nest is only just wide enough to admit the mother-wasp, and so of course to fly in with a caterpillar in her mouth is simply impossible. She gets over this difficulty however, by unrolling the caterpillar (as she generally carries it rolled up) and carrying it in uncoiled beneath her body. She thus takes it to the bottom of the cell, and placing it over the egg carefully presses it down, and the creature of itself immediately rolls into a ring, encircling the egg. The mother knows exactly how many will be wanted, and the greedy little grub is generally supplied with as many as twelve caterpillars, each much larger than himself. The mother having in this way provided her young grubs with food proceeds to finish the potting operation by taking down the tower, closing up the mouth of the cell, and makes others in the same way.

There is a third kind of *mason wasp*, which, instead of laying up a store of potted caterpillars for the young grubs, imprisons only one living insect at a time, and then, when that is eaten, opens the nest and puts in another ready for the use of its inmate. A gentleman once saw a wasp of this kind dragging along a caterpillar at least three times her own size, and gliding along with this heavy burden in the most active manner over the grass and other weeds which grew in her way. When she got to the nest she proceeded to lay the caterpillar down and remove the lumps of earth which stopped up the entrance; having done this, and cleared the passage down into the hole, she went down to see if all was well at home, and then came back, seized the caterpillar and pulled it in after her. After thus introducing it to the grub she returned to the surface, and by rolling pieces of earth into the hole and scratching in the dust which lay about with her fore feet, and then regularly treading it down, she stopped effectually the entrance; having then made the top of the entrance on a level with the rest of the ground, she flew up to the top of a fir tree two or three times, as if to examine its appearance. After satisfying herself as to that, she flew back with two fir leaves and placed them near the hole, as if with a view of marking the spot.

Having thus described, as well as I can, these various kinds of wasps, I think we shall begin to admire the stinging creatures which fly across us so often during the sultry days of summer. I may also mention that wasps are not at all inferior to bees in attention and kindness to their young. It is amusing and wonderful to see how actively they run from cell to cell, putting their heads into the cells of the very young grubs, and giving them a drop of sweet juice. As they grow older they are fed with more substantial food, and begin, like young birds, to put their heads out, and seem to ask for it when they hear their mother come near. Wasps eat not only fruit, but also flies, bees, and even meat. The special delicacy is a dainty *Bluebottle* fly, and they are very active in looking after them, and indeed, as a rule, the fewer wasps there are, the more flies. So that they certainly do some good in keeping down the enormous increase of flies. They are particularly fond of bees; they will watch sometimes for hours at the hive door, and seize an unfortunate bee, laden with honey, just about to enter, and in a moment bite its head off. They do this to make it a lighter burden for them in their flight. As soon as they arrive home with their booty, all those who have been working in the nest crowd round for a share, and the carcase is divided between them and the large grubs, and the honey is given to the little ones.

Wasps also show remarkable affection for their home. If their nest is broken to pieces, they will still linger for whole days round the spot, and even follow to the place, if they can discover it, where the combs have been deposited. On the approach of winter, however, they follow quite a different plan of action, for they drag the grubs from their cells and kill them, strewing the ground all round with dead bodies. This seems cruel, but it is done for the best, and is necessary, for wasps can lay by no stores for the winter, and the young would otherwise die in all the agonies of hunger when no more food could be procured. This is a singular instinct given them by the Merciful Author of All Things, who has taught those who have lived all but their appointed time, to put the others to a short and easy death before they die themselves. One further remark may be made on this providential arrangement. Were a whole nest of wasps to live through a winter, as would be possible if the winter were mild, they would multiply so fast that flies, bees, and all other insects on which they feed would soon be destroyed, and they would become a perfect torment to man.

There were forty-four persons present, including Messrs. H. C. G. Moule, F. Storr, and F. E. Thompson.

MEETING HELD SEPTEMBER 28th, 1865.

EXHIBITIONS :—

BY THE PRESIDENT.—A large quantity of Honey-comb, in which were the Caterpillars of the Honey Moth (*A. Grisella*).

BY J. POLE.—Specimens of the Figure-of-Eight Moth (*D. Cæruleocephala*). The Twenty-Plume Moth (*A. Polydactyla*). The Four-Plume Moth (*P. Tetradactyla*).

BY E. A. KING.—Deposit of lime from the bottom of a boiler at Preshute House.

A. C. ALMACK asked if any one could give him any information on the subject of Squirrels coming into a town garden and eating pears?

J. POLE said that he knew an instance of their eating grapes in a similar way.

The following paper was then read by the President, on

"THE EXTERNAL CHANGES OF A MOTH."

ON examining the external appearance of any caterpillar we shall observe that it consists of two distinct and dissimilar parts, viz., a long cylindrical body, covered with a membranous skin, enabling the animal to bend its body almost double if necessary, and a head with a hard covering, generally of a different colour from the body. The fitness of this hard covering will be at once apparent, when we consider that the muscles necessary for moving the jaws have no other surface to which to attach themselves. I propose, then, to give as clearly as I can a general description of these two parts of the larva in order, noticing any striking exceptions to what appears a general rule.

And first the *body*. This consists of twelve segments or rings, very similar to one another, and covered with a soft membrane. The general appearance of a caterpillar does not, however, always assume this regularity; for instance, we meet with a *horn* at the tail of Hawk-Moth larvæ, *humps* on the backs of other species, or still more irregular forms, as in that of the *Puss Moth*, or the *Lobster Moth*. Others again are covered with hairs, either spreading out equally in all directions, or arranged in bunches like a clothes-brush, &c.; but still we shall find that all have twelve, and only twelve segments. Next we shall observe in some of these segments (nine in reality), a pair of small orifices, one on each side. These the animal has the power of opening and closing at pleasure, and are connected inside with a series of tubes, which will be noticed hereafter. These tubes form the breathing apparatus, and these eighteen holes are the means of communication with the external air, and are called the *spiracles*. As the life of the insect really depends upon their being perfectly free and open, we sometimes find them protected with hairs, or covered with a very thin membrane, punctured with numerous holes. In one instance (viz., in the larva of *Aglossa pinguinalis*, which feeds in grease), each segment of the body is divided into two, and underneath into two fleshy folds; and hence, when necessary, the spiracles can be entirely closed, or only opened a small distance. Were it not for this contrivance, the larva must of necessity be soon suffocated.

There is yet one other thing to notice about the body, and this is the leg. The number of legs varies very much in different species, but we shall almost invariably find on the three first segments of the *body*, three pairs of legs, different from those on the other segments. These are the true legs, and become those of the perfect insect. Though very short, they are nevertheless composed of a series of five joints, and have a harder covering than the rest of the body. As these legs are not very much altered, except in size, I shall defer a more minute examination of them till I come to the perfect insect. The other legs, which are membranous like the rest of the body, are those which are of the greatest use to the larva. They are called *prolegs*, inasmuch as they are merely for the temporary use of the larva, and are situated in pairs on the under side of the segments which form the abdomen. They are frequently furnished with from forty to sixty minute hooks, alternately long and short, and turned *outwards*. When the animal wishes to walk, it contracts the centre of the foot, and these hooks are drawn out of the object to which they have become fastened. After it has taken a step the centre is pressed down, and the hooks are forced out, seizing hold of the object on which the larva is walking. Most larvæ of Butterflies have the end of this proleg expanded out into a triangular instead of circular shape, with the inner edge of the sole beset with these hooks. The shape, however, varies very much in some species. We *very* rarely meet with legless larvæ; in fact, until very recently, the idea of a larva without legs was laughed at; but yet some leaf miners are entirely destitute of these appendages, and merely secrete a kind of gluten for the purposes of progression.

I remarked that the *number* of legs varied very considerably. It is in the number of prolegs that the variation occurs. The true legs are always six when present; but in the case of prolegs, the number varies from two to ten. The genus *Nepticula* has eighteen, but then it has no true horny legs, and the third pair is not so fully developed as the others. As regards the *position* of these prolegs, we almost invariably find a pair on the last or anal segment, but none ever on the 4th, 5th, 10th, or 11th segments. In the case where there are no legs on the last segment (*C. Vinula*), the anal legs are modified into a pair of anal horns. It is not known what particular object is gained by this modification; but when irritated the larva has the power of extending them to twice their ordinary length. Ten and eight are the usual number of prolegs; one genus (*Plusia*) has only six; but a very large class are obliged to content themselves with four. These have two on the last, and two on the 9th segment; and from having this limited number they are obliged to walk in a peculiar manner, bending the body up into the form of an Ω, and as by this movement they apparently measure the distance over which they walk, they have received the name of *Geometers*, or *Loopers*.

Such, then, is a rough sketch of the external character of the *body*. I now come to the *head*, and here I shall make a few remarks on the *antennæ*, *eyes* and *mouth*. This portion of the animal is particularly free from appendages, though we do meet with horns of peculiar shapes in a very few (e.g. *P. Machaon*, and *A. Iris*). The *antennæ*, from their small size, are seldom if ever observed; they are nevertheless present, and consist of two or three joints, capable of being folded up. In the case of the Goat Moth, the joints slip into one another like those of a telescope. The *eyes* are usually twelve in number, arranged in two circles on the top of the head. Each has its own cornea, crystalline lens, and retina, so that twelve distinct objects are conveyed to the brain; but from the fact of their being *fixed*, this number is doubtless absolutely necessary for the purposes of the larva. The *mouth* is by far the most important part, which I shall now proceed to describe. The simplest way of describing a caterpillar's mouth is by comparing it with our own. If we conceive our upper and lower jaws to be divided down the middle, and the two halves of each to move from side to side, meeting in front, our lips and tongue remaining as they are, we shall have a pretty good conception of an insect's mouth. In fact, it consists of an upper and lower lip, two pairs of jaws, and the rudiments of what is generally considered to be a tongue. There are in addition four feelers or *palpi* on the head, and a spinneret in the mouth, each of which I shall briefly notice.

The *upper lip or labrum* is a broad plate of varied form with a notch in the centre, probably to guide the food in eating, and is quite immoveable.

The *lower lip* or *labium* is also of varied shape, and immoveable, and frequently connected with a fleshy protuberance, referred to above under the name of tongue; both, however, are but very rudimentary.

The *upper jaws* or mandibles consist of two hard triangular plates working by means of very strong muscles in such a manner that their extremities meet like a pair of pincers, these ends that meet being furnished with two or three teeth like those of a saw. It is this portion of the mouth which is indispensable to the larva. The muscles which work these must be of comparatively enormous strength, when we consider that some larvæ live in wood, and bore long galleries in the living trunk of the tree, rendering it totally unfit for timber.

The *lower jaws* or *maxillæ* are of a totally different character. They are merely two fleshy protuberances, and do not act upon one another. Hence they are not suited for mastication, though they may possibly assist in holding the food to be masticated; but they will be, as we shall see, very important to the future insect.

The four *feelers* are arranged in two pairs, called from their position the *maxillary and the labial palpi.* The former are situated just at the back of the lower jaws; the latter on each side of the under lip. They are both small, the labial palpi very rudimentary, and their use is probably to examine the quality of the substances to be devoured. The *spinneret* is a thread-like organ, cut at the end obliquely like a pen without a point, and having contractile sides, though with only one opening, and in this point differing materially from the spinneret of a spider. This will account for the varieties observable in threads, some being seven or eight times as thick as others; some quite smooth and round, and some channelled. This spinneret communicates with two bags, filled with a gummy matter, which hardens on exposure to air, and which constitutes the silk used not only for the cocoon, but also as a means of safety; for many larvæ, when blown or shaken off the tree, let themselves down gently by means of a thread spun for the occasion, and by which, too, they sometimes regain the branch, though under any circumstances it is a matter of great difficulty. In spiders, the spinneret being situated at the *tail,* the animal has only to bend itself round so as to grasp the thread, whereas in caterpillars the legs are far too short for reaching the thread which proceeds from its mouth; and hence it is obliged to jerk itself to one side, and catch the thread as best it can between two of the front segments of its body. When it has succeeded on one side it proceeds to do the same with the other, and thus gradually to raise itself to the branch; but this process is exceedingly tedious, and, if the animal happens to miss the thread, the toil of hours may be rendered useless by its slipping down again.

I have thus glanced at the external conformation of a larva. Before proceeding to examine its internal structure, I purpose to trace the various changes undergone by these parts as the animal assumes the Imago or perfect state. When the caterpillar has become what is called "full fed," *i.e.* just previously to its assuming the pupa state, it alters considerably in appearance. Its fine colours assume a dingy brown, and if clothed with hairs, these fall off at the slightest touch. It gradually contracts till it is barely half or two thirds of its original length, and shortly afterwards casts off the caterpillar skin, and presents a totally different appearance. All its parts are, though distinct at first, very soon glued together by a gummy fluid, which covers the whole animal, and which hardens on exposure to the air; yet the various limbs of the future Imago can be very distinctly traced. There is also a more distinct division of the body into three parts, viz., the head, thorax, and abdomen, which is caused by an alteration in the proportions of the various segments. Thus the first six segments are very much shortened, except the third, which is very much extended.

Internally the pupa is at first of a milky consistence, in which the unformed members of the perfect insect may be said to float, and in which they may be discerned and separated. In proportion as these acquire consistency, and are more and more developed by the absorption of the surrounding fluid, they occupy its place, and fill up the cavity of the puparium. The rest of the fluid passes off by transpiration. There are often no appendages to the pupa, though in some instances we find it provided with a series of hooks round each segment, or even in some few cases the body is covered with scattered hairs. The former enable the animal to shift its position, which is very necessary, especially for those which live inside the stems of rushes, and other aquatic plants. The speed with which these animals can ascend the hollow stems of reeds is perfectly marvellous, and could scarcely be credited by those who have not had ocular proof of the fact.

I now come to a description of the external characters of the Imago or perfect insect. The change undergone by the animal is so complete that there are no parts which present the same appearance. The body, which in the larva presented a uniform cylindrical appearance, is now divided into two distinct parts, the head being still more distinct. But, as we shall see, no essential parts are destroyed; and in almost every case it will be found that the difference is merely one of *change*, not of destruction, or increase of any members. The whole length of the Moth is very much the same as that of the pupa; the segments have, however, undergone a second change. The first is very small; the second and third have become united, the latter being now very large; the fourth and fifth are now very small; the others pretty much the same as in the pupa. The body is now covered with hairs and scales, the latter arranged like tiles on a roof, whence the name of *Lepidoptera* is given to this order of insects.

The prolegs have entirely disappeared and the true legs have now received their full development. Each leg consists of five divisions as in the larva. The first two divisions are small, and very moveable; the third, the thigh, is the largest and most robust segment of the limb; the fourth is thin, and can only move in two directions; and the fifth, or foot, is composed of several joints, varying in number with the species, and sometimes even with the sex. The terminal joint, which in the larva ended in a single curved point, has two hooks or horny claws, whereby the insect holds fast to the object on which it moves. The six legs are in general perfectly developed, though the first pair are very rudimentary in some butterflies. In addition to these legs, the thorax, which is the portion of the insect destined for the organs of locomotion, is now provided with two pairs of wings. These, which do not in any way correspond to the wings of birds, consist of two layers of membrane, between which are numerous tubes, supplying air to the wing. There is also a circulation going on between these layers. They are of large size when compared with the body of the insect, and might be traced under the covering of the pupa, though of much smaller size. In fact, on first emerging from the pupa-case, the wings are but small and very soft and flabby, and the first care of the animal is to rest on some place where the wings can hang down; in such a position they soon enlarge, and in an hour or so have attained their full size, however large the wing may be. Some further time is requisite in order that the wings should dry, after which the animal never increases in size, and hence large specimens of moths are not necessarily older than smaller ones, but have obtained that size from the larva being better fed.

I must not omit to say a few words on the *scales* with which the wing is covered. They are very variable in size and shape, and are arranged so as to overlap one another. It is to these scales that moths owe the brilliancy of their wings, the wing itself being merely membranous. The scales on the edge of the wing are of a different shape from the others on its surface, and when very highly magnified have been observed to have peculiar appendages, so various in the species and sexes that it would be possible for a person properly acquainted with the subject to determine the species and sex of the moth to which a small fragment of a wing originally belonged. In order to keep the wings on each side together, and so offer a greater resistance to the air, a minute bristle has been observed on one wing which passes through a loop in the other.

I shall conclude the external character by an examination of the head of the butterfly, and in order to explain the changes undergone, I shall take each part separately, and in the same order as was followed in the description of the larva's head.

The head itself is now perfectly distinct, but united to the body, by a thread-like ligament, not sunk into a cavity in the thorax as in the larva. The *antennæ* are now generally very long, varying extremely in form, not only in the different species, but also in the sexes among Moths. The most marked distinction between butterflies and moths is in their antennæ; the former have a knob at the end, whilst moths have them tapering to a point. In moths, too, the female has generally very slender antennæ; the male, on the other hand, has them shaped like a comb, and more or less complicated; of what use the antennæ are is still a matter of doubt. Some have considered them to be the organs of touch, others of hearing, others of smelling, or at all events of examining the nature of their food; perhaps the sense of *hearing* seems to be the most likely, though moths and butterflies seem to have that sense in a very slight degree.

The *eyes*, again, are quite different in the two stages; the twelve simple eyes have now been replaced by a pair of very large granulated eyes, situated at the sides of the head, and often with a pair of simple eyes at the hinder part of the head. These latter, however, are generally covered with hairs or scales, and therefore useless for the purpose of sight. The granulated eyes are very remarkable; they are composed of a very large number of simple eyes, pointing in every direction, and this is most necessary. Sight is the essential sense of all others requisite for the perfect insect, and as the eyes do not move, this defect, if we may so term it, is compensated by the greater number of simple eyes. The number varies in different species, but some idea of their number may be obtained from the fact that the Silk-Worm Moth has no less than 6,236; the Goat Moth 11,300; and a species of Butterfly has been found to have upwards of 34,650. That each of these single eyes is perfect is easily shown by mounting the outer slice of one of these compound eyes as a microscopic object, and then looking at another object under the microscope, through this slice; when properly adjusted, the further object may be seen through each of the simple eyes, as if there had been a corresponding number of small lenses instead of the slice of the eye.

And now for the *mouth;* and here we shall find an equally remarkable change, though no diminution in the number of parts. In the larva, the upper lip and two mandibles were most fully developed, whilst the lower jaws and under lip were very rudimentary; the maxillary palpi minute but distinct; and the labial palpi almost obsolete, with the lower lip terminating in a spinneret. In the perfect insect, on the other hand, all these parts are reversed in importance, —the upper lip and mandibles are very rudimentary, so as to be useless for feeding, but the lower jaw and maxillary palpi are now enormously developed.

In certain classes the mouth varies very much. Thus in the Bombyces (to which the Silk-Worm belongs), the whole mouth is perfectly rudimentary, and the insects consequently take no food. In the Ghost Moths there are no labial palpi; and in the Emperor Moth the organs of the mouth are replaced by fleshy tubercles. The modification of the lower jaws deserves especial notice. Each of these jaws in the larva state was merely a short fleshy protuberance; but in the perfect insect has become much enlarged (in some instances to a length of six inches, or even more).

These two jaws form what is called the *proboscis* of the Butterfly, which is essentially different from that of the Elephant. In the Butterfly the proboscis is composed of two parts, separable at the will of the insect, and kept together by a series of hooks, which fit in between one another, and which are of such a length that when thus interlaced they help to form the top of a tube. The two jaws themselves, though thick and round, are scooped out on their inner sides, and form the remaining walls of this tube. The two parts of the proboscis, therefore, only form *one* tube for the purpose of drawing up food into the mouth; each half has small tubes running the whole length, but they are merely for the purpose of admitting air, and have nothing whatever to do with the part used for feeding.

In some species the extremity of each of these parts of the proboscis is studded externally with a great number of minute bodies, shaped something like barrels, with smaller projections at their extremity. These, judging from their structure, and from the circumstance that they are always plunged deeply into any fluid which the insect takes as food, Mr. Newport supposes may be organs of taste.

I have thus rapidly glanced at the external changes undergone by the larva in its progress towards the perfect insect, and we can thus see how much the animal has risen in the scale of creation; for the larva, which may be considered as a series of twelve similar rings and a head, has been transformed into a body composed of three distinct parts, each part having a separate use, and the powers of locomotion enormously increased.

There were forty-one persons present.

MEETING HELD OCTOBER 13th, 1865.

EXHIBITIONS :—

BY THE PRESIDENT.—A Death's-head Hawk Moth (*A. Atropos*), found in the tower of Mildenhall Church, and lent by the Rev. J. Sowerby. Specimen of Cloth made from the wool of the Vicuna of South America. It is an expensive article, owing to the trouble in weaving it. Piece of a dress made from the fibres of an Indian pine-apple. Specimens of Pampas Grass (*G. Argenteum*), from a garden in the neighbourhood. A flower of the Jerusalem Artichoke (*Helianthus Tuberosus*), showing the unusual warmness of the season, since our climate does not generally allow the flower to come to perfection. A bunch of raspberry *flowers*.

BY F. E. THOMPSON, ESQ.—Two specimens from the Silurian bone-beds at Ludlow. The exhibitor made some remarks on these bone-beds, saying that they were perhaps formed in consequence of many fish having resorted thither, when water covered that part of the land, to recruit their health, and found their grave there instead.

By W. W. Dayman.—The third drawer of the College collection of *Lepidoptera*, containing the *Lycænidæ* and *Hesperidæ*. Specimens of *C. Aprilina* and *O. Dilutata*, bred by him from pupæ found under elms, in July and August.

By J. Pole.—A variety of the Clouded Yellow Butterfly (*C. Helice*), taken at Torquay, June, 1865.

By A. Marshall.—Specimens of tin ready for smelting, and smelted. Silica from the ashes of a straw rick.

By J. W. Whitaker.—Cotton from Queensland.

By W. W. Melville.—A Clouded Yellow Butterfly (*C. Edusa*), taken near Marlborough, October 9th, 1865.

A. C. Almack then read the following paper, on

"THE MIGRATION OF BIRDS."

I cannot begin my remarks on this subject in a better way than by quoting the words of the great Cuvier, who says that "Birds are large moving republics, and that they belong more to the air than to the earth." If we remember this, and look upon these creatures as an order entirely different from the brute creation which exists upon the earth, we shall not find it so hard to understand their long journeys and migrations.

Perhaps it may be as well to state a few of the causes for migration. There are two principal ones; want of food, and want of proper temperature. How far these two act upon the same individual species it is very hard to determine, though at first sight we might be tempted to say that they act conjointly, and to an almost equal degree, especially if we are considering our winter migrants, by which I mean birds that come to us in the winter. But if on the other hand we look at our summer visitants, it seems as if their migrations must be always caused by a want of a sufficiently cool temperature, for at that time of the year there is apparently, almost everywhere, a sufficient amount of food for all species of birds.

There is another cause which I think we may look upon as secondary, viz., that of finding a suitable place for breeding. I say secondary, because it seems to me that instinct would tell a parent bird not to make its nest where it could not be able to find food for its young, or where the temperature would not be suitable to them; it would not therefore be such an important cause as either of the other two.

The want of a proper temperature seems to be the most important cause of the two before mentioned. For it is a very curious, and at the same time a well authenticated fact, that all our summer visitants come from the south, and all our winter visitants from the north, thus shewing that the former are compelled to migrate on account of the warmth of the atmosphere, and the latter on account of the coldness. Of course a want of proper temperature will, in the case of the latter, naturally produce a want of food, as they come from lands where all creation is, during the winter, covered to a large extent by snow; but how far want of food alone would go towards causing a migration is a question which would probably be decided in favour of temperature being the stronger cause.

Having thus briefly stated the causes for migration, I will now proceed to consider the way in which it is accomplished,—a point of much controversy among Ornithologists. The questions which naturally arise on a consideration of this subject are, how do they find their way, and how do they manage to keep on the wing for so long a time? These are questions which can only be answered partially from facts, which themselves can be but sparingly gathered from actual observation, and from the comparison of individual instances.

To take the first question,—how do they find their way? how does a swallow, starting from Africa, know its way to England? how does the same martin know its way to the same nook under our eaves that it frequented last year?

To our minds of course only two possible ways suggest themselves by which they can guide their course, viz., either by the eye or by the instinct. Between these two it is extremely hard to decide. Taking the case of the eye being the guiding power, it will follow apparently that the migration takes place in the day-time; and if we adopt the theory that the eye does guide, we must set aside the opinion of those naturalists who hold that they migrate at night-time. But, on second thoughts, we must remember that moonlight nights might serve as well, as they probably do; it being a remarkable fact that many of the migrations of birds are affected by the changes of the moon. There are many considerations, too, which support this theory, the chief of which are the two following:—Firstly, that these migrations are of course very much affected by the winds, and would therefore probably take place, especially in the case of small birds, when there is but little wind to impede them; and, taking the average, we shall find that the wind is strongest in the day time. In speaking of the winds I may mention the interesting, and at the same time curious fact, that at the season when our birds are migrating northward, south winds are most prevalent, and north winds about the time they are coming southward. This curious provision of nature tells rather against the supposition that they travel at night because of the wind, but at the same time the supposition is of value, especially with reference to small birds, as any strong winds, favourable or unfavourable, must impede them. The second consideration in support of the opinion that migrations are nocturnal is that the dangers of travelling by night would be a great deal less than those encountered by day, which consideration has more weight, I think, than the former about the winds.

To return to the actual question about the eye. We know that a bird cannot see the whole extent of a journey at one glance, but that by seeing different objects, by using the instinct as a helper to its eye, we can easily imagine that it can guide its course right; so probably the eye cannot guide without the instinct. But can the instinct without the eye? Of course, judging from ourselves, we should immediately reply in the negative. But take the case of the passenger pigeon. It is taken shut up in a basket to a place, where it is let out, and finds its way home in such a short time as to render it most improbable that they lose their way. How possibly can the eye help it in travelling over country where it has never been before? We must merely come to the conclusion that it travels by instinct, and so probably it does; but we have no reason for saying that all birds are endowed with like capacities of guiding their course. Indeed, evidence goes far to prove that the passenger pigeon is a singular exception. Hence, of the two it seems rather more likely that they guide by the eye. But of course it is a question which can hardly be definitely settled. There is a piece of further evidence that they fly by sight, namely, that swallows and other small birds often alight on vessels in the Channel in foggy weather, in a state of great fatigue and weakness, which seems to indicate that they are unable to see the land.

I will now proceed to the consideration of the second question I proposed, viz., how do they manage to keep on the wing a sufficiently long time? Migratory birds come to us chiefly, as I said before, from the north-east and south; from Sweden and Norway on the one hand, and from Africa and the southern countries of Europe on the other. In both of these cases the distance across the sea is not great. But it is very probable that most of them, even the very smallest, perform not only the sea voyage, but the whole journey from Africa to England at one flight.

In the case of the swallow it does not seem at all an impossibility to us as we see them on the wing for so long together, and flying with such an astonishing rapidity, but that the wrens and warblers should be able to do this does at first seem very startling. But I think the following fact ought to set at rest most doubts. There is a beautiful little blue-throated warbler, known by the name of the *sylvia cœrulecula*, which has its summer quarters among the high northern latitudes of Sweden, Finland, and Siberia; whereas during the winter months it is staying principally in Egypt. On its spring migration, which takes place during the earlier half of May, the first place north of Egypt where it is to be found with certainty in pretty considerable numbers, is Heligoland. Nowhere in the whole intermediate distance is it found, except as a great rarity, not even on the neighbouring north coast of Germany; whilst in Heligoland it is in such numbers that as many as twenty were brought out one day to the naturalist, from whose paper in the Zoologist I am taking this account. The foregoing admits of one conclusion only, viz., that this little bird performs the passage from Egypt to Heligoland in one uninterrupted flight, the distance being over 1200 miles. "As it travels," says the same naturalist, "during the night, as many of the small or insectivorous kinds do, and starts about sunset, arriving at Heligoland a little before sunrise; the time occupied by the journey will be from twelve to fourteen hours."

But besides our winter and summer migrants we have also the occasional visitants. Many of them come from America, and the question is how do they come to us? Do they come across the Atlantic or not? The mere comparative view of these occasional visitants to Great Britain and Germany will lead us to the conclusion that the route of the American birds to England is across the wide ocean, for almost all the additions to the European birds, of species purely American, have been obtained in England, which would not have been the case if they had proceeded in any other but an eastern direction; whilst the additions by Germany to the lists of European ornithology consist almost entirely of Asiatic species. The distance between Newfoundland and Ireland is about four hundred miles more than that from Egypt to Heligoland; but we must remember that most of our American birds are considerably larger than the little blue-throated warbler. Hence, I think, we may conclude that birds perform their journeys at one flight, and that American birds come to us across the Atlantic. But, while speaking of these long flights, it may perhaps be worth my while to mention that some ornithologists think that birds which are not water birds by nature are able, when compelled by fatigue, to rest upon the water, though they may have no power of making any progress in that element. Though it may seem impossible that such should be the case, such birds as thrushes and snow-buntings have been actually seen to rise up from the sea at a considerable distance from land, when apparently in a very fatigued state from a long flight. Let us now proceed to speak of the punctuality with which migrations take place every year, especially in the case of summer migrants. I will take the case of the swallow. In a list of its first appearances near Cheltenham, which is to be found in the "Zoologist," p. 6604, on taking the average date we find it to be April 7, the dates being from the years 1851 to 1859 inclusive: April 3, 6, 5, 15, March 28, April 12, 8, 10. Now the day on which a swallow was first seen here last year was March 28, and the next appears to have been seen on April 2, so that in the one we exactly coincide with the date given in the list I speak of for the year 1856; and on reference to a letter I have from a naturalist at home in Oxfordshire, I see that his first date of their appearance is April 14, so we see that they do not vary much. Having mentioned the swallow, I may perhaps as well say a few words about the opinion held by many persons, viz., that many of them remain in a state of torpidity during the winter. I think, however, that it is pretty evident that some, though probably but few, which have been retarded in the rearing of their young, or some young birds that are not strong enough to perform the long journey, do hide themselves in crevices in rocks, or in old church towers, and exist there through the winter, else it seems hard to account for swallows found in those situations, and for their occasional appearance on warm sunny days in December and January.

Now to take the case of the nightingale, as showing the tolerably punctual arrival of birds in this country: according to the same list it was first heard near Cheltenham in the same years on the following days: April 15, 13, 15, 12, 14, 22, 10, 11, 12, whence we see that in every year except one, viz., 1856, its arrival varies only between the 10th and 15th. And on reference to my friend's list I see it appeared with him this year on April 8. I am sorry that, as this bird's appearance has only once been recorded, I cannot compare these dates with any of our own. I might proceed with these comparisons to a still greater length, but I think it would perhaps be tedious. Let me say in passing that our ornithological notes last half would have been much more valuable had they contained more dates of first appearances. A great help towards being able to note a bird's first appearance in the spring is to know its song, for many of our summer migrants are so small that their species is not easily detected at a distance.

Let me conclude my remarks by a few words on partial migrations, which are extremely interesting, and might well afford a subject for a separate paper. By partial migrations I mean the migrations which do not take the birds entirely from our shores, but only from one part of England to the other. During the autumn months wagtails perfectly swarm along the banks of the Thames, but almost totally disappear in the winter, while on the other hand chaffinches in winter are so abundant that they could not possibly have all been reared in that neighbourhood. Kingfishers almost entirely disappear in some parts of the country during the winter, but there is no reason to believe that they are real migratory birds.

There were forty-six present.

MEETING HELD OCTOBER 27TH, 1865.

EXHIBITIONS:—

BY THE PRESIDENT.—The Skull of a Horse. Specimens of the following Fungi: The *Phallus Impudicus* or Stinkhorn, found in Savernake Forest by E. Lloyd. *Polyporus Betulinus*, occasionally eaten on the Continent, and used for making razor-strops; *Clavaria Fastigiata; Boletus Parisiticus; Scleroderma Vulgare; Scleroderma Verrucosum; Rhytisma Acerimum*, growing in black blotches on the maple leaves. Two specimens of the Death's-head Moth (*A. Atropos*); one alive. A variety of the Meadow Brown Butterfly (*H. Janira*), having white blotches on three of its wings. A Box of gorgeous Brazilian Butterflies. A monstrosity of the Yellow Toad Flax (*Linaria Vulgaris*) with *two* spurs.

BY H. W. BRACKENBURY.—A piece of Gypsum.

BY J. BOURDILLON.—A Medallion, cast from the rough lava of Vesuvius.

BY A. ARMSTRONG, ESQ.—A bunch of ripe Raspberries.

By J. Pole.—The following Lepidoptera:—The Glanville Fritillary (*M. Cinxia*); The brown Hair-streak (*T. Betulæ*) caught in Devonshire; The Queen of Spain (*A. Lathonia*); and the Chocolate prominent (*C. Reclusa*).

By H. A. Evans.—The Sphinges of the College collection of Lepidoptera.

By A. Marshall.—Two nuts of Vegetable Ivory; one perfect, the other carved. A Palmetta Leaf with inscription.

By G. Williams.—Specimens of Indian and fossilized Coral; also of specular Iron and Gypsum.

The President read the following paper on the

"INTERNAL CHANGES OF A LEPIDOPTEROUS INSECT."

He illustrated the paper by means of an oxy-calcium microscope.

Having described the external changes undergone by a larva in its progress towards the perfect state, I now proceed to describe the changes undergone internally, and for this purpose I shall notice in order the following systems:—the sensitive, digestive, circulatory, respiratory, and muscular, describing each as shortly and yet as clearly as I can.

To begin, then, with the sensitive organs.—In vertebrated animals the brain is the seat of the mind, and from it proceed the nerves, which are the organs of sensation, and thus all sensation is traced up to the brain. This brain is situated in the *head*, but in insects we cannot fix positively upon any part corresponding to the brain of vertebrates. We see, however, nerves branching in all directions, and upon tracing them to their origin we find them connected with large masses or knots, situated at intervals throughout the whole length of the insect. In the caterpillar there is a separate knot or *ganglion* to each segment of the body, and as there are thirteen segments including the head, there are thirteen knots in the whole body. That situated in the head is rather larger than the other twelve, and consists of two lobes, from which spring several pairs of nerves to the eyes, antennæ, jaws, &c.; each of the other ganglia gives out four nerves, two ascending to the back and two descending (and where there are feet, decending into them.) In the thirteenth, however, instead of four nerves there are no less than eight, and hence the total number of nerves in the whole larva is sixty-two. These knots are connected together by a single thread, except in the region near the head, where it separates, and thus the first six ganglia are joined by a *pair* of threads. The threads which join the second and third surround the gullet, and the nervous system, therefore, which at first is situated above the mouth, runs afterwards along the underside of the body. As these ganglia are so similar, it stands to reason that they each answer in some measure the purposes of a brain, and such is found to be the case. Many of these animals may be cut in half, and each part will continue moving as if nothing had happened. Everyone must have observed this, in the case of a wasp, for instance. Mr. Newport experimented upon a centipede, whose nervous system corresponds closely with that of a caterpillar, and he found that if its head were cut off whilst the animal was in motion, the body would continue to move forward by the action of the legs, and that the same would take place in the separate parts if the body were divided into several distinct portions. Nay more, that if after the action had ceased, the nervous centres or the cut extremity of the nervous cord were irritated, the muscular action would be excited afresh; and still further, that if a portion of the nervous cord were removed from the body of the insect, the parts of the body still possessing the cord would continue to move, whilst that portion which had been deprived of the nervous centres would remain perfectly still. Hence we see that nerves are absolutely necessary for motion, and they perform, therefore, two distinct offices; one, that of enabling us to feel pain, and the other that of being able to move our limbs. These two offices are perfectly distinct, so much so that one can exist without the other, hence it follows that though an insect has nerves, it may not necessarily feel *pain*, the nerves being necessary for motion. How far this may bear upon the question whether insects feel pain or not, must be left to each one to decide.

But to return. The ganglion in the head, which, as has been remarked, is larger than the other twelve, really consists of several pairs of ganglia, which have been fused (as it were) into one mass. Its development, however, so closely agrees with that of the eyes that it is now considered chiefly as the *optic* nerve, and corresponds with the optic lobe of fishes. As this optic nerve increases very considerably as the insect approaches its perfect state, and as also the rest of the nervous system is altered very considerably, I shall here describe the various changes undergone by it. When the larva is about to assume the pupa state, a very remarkable series of changes takes place; at this period the length of the caterpillar is considerably diminished, and consequently the ganglia are brought nearer together; the cords are not shortened, and consequently they assume a sinuous form, and the side portions in the thorax are more widely separated. The ganglia themselves have not yet undergone any great change, but the ring round the *œsophagus* is much contracted, and the nerves of the wings begin now to be considerably developed. In a few days after it has assumed the pupa state, the cord adapts itself to the shortened dimensions of the body, and now lies straight as in the larva; but then the union of the various ganglia has considerably altered the appearance of the nervous system. The ganglion of the head increases greatly, and continues to approach the first ganglion of the body till the two are completely united. The fifth and sixth approach one another till they unite, the third and fourth following their example, and then these two masses approximate till in the perfect insect there is but a small loop between them. The seventh and eighth entirely disappear, and we see a long cord between the ganglia of the thorax and the first ganglion of the abdomen; the other ganglia remain nearly as they were except in being a little smaller. Thus we see that the tendency of the ganglia, as the larva assumes a more perfect state, is to unite, and to concentrate in the head and thorax, the former being the position of the organs of special sensation, and the latter of locomotion. In consequence of this union of the ganglia in the thorax, we may presume that this is the most vulnerable part of the moth, and this is found, by actual experience, to be the case. If this mass of nerves be severed, the moth will either be killed, or at the very least will be rendered motionless to a great degree; and hence if a penful of oxalic acid is thrust in here, when done properly, the animal is almost instantaneously killed. Squeezing the *head* instead of the thorax, so commonly adopted by beginners, is not very often effectual. I have heard of a Dagger moth (*A.Psi*) which, when enclosed in a box, the captor endeavoured to kill by heat. The animal *would* not die for some considerable time, and on opening the box it was discovered that the head had been chopped off when the lid was put on, and that thereby its vitality had been rather increased than diminished.

We now come to the *digestive* system. In a caterpillar the alimentary canal is (as in other animals) divided into four parts—the gullet, stomach, large intestine and small intestine; but they are what are called *simple*, being short and thick, and communicating with one another in a straight line; in fact, we may conceive the alimentary canal to consist of a large tube, running the whole length of the body, and very nearly filling up its interior. This tube is of a rather smaller diameter at each end, that portion next the head forming the gullet, and that next the tail the large and small intestines, which latter are distinguished by a contraction of the canal between them.

The whole life of a caterpillar is spent in eating and sleeping, and hence the stomach is of enormous dimensions compared with that in other animals. As, however, the perfect insect eats but little, and in some instances not at all, this enormous stomach would be useless to it, and we consequently find that a very great change has taken place in the form and size of the alimentary canal by the time the moth or butterfly emerges from the chrysalis. The gullet and intestines are very long and thin, and the stomach is now quite small, broad in the middle, and gradually narrowing towards each end, so as to assume the shape of a spindle.

At the end nearest the head is an appendage called the honey-bag, and between the large and small intestines are a number of thread-like appendages, which are supposed to answer the purpose of the liver in higher animals. As the absence of blood-vessels in insects prevents them from having any gland, the bile is produced with them, as all their other secretions, by slender vessels that float in their nutritive fluid, and from thence secrete the elements proper to form that important fluid necessary for the digestion of their food. These slender threads undergo no alteration, as the animal passes from the caterpillar to the perfect state.

There are yet two very curious appendages still unnoticed which may be properly mentioned here; they are the silk secretors, and are of course connected with the spinneret. These consist of two bags, filled with a gummy fluid, and are of various sizes, according to the amount of silk required by the caterpillar. For instance, the silk bags of the silk-worm moth, which requires a large quantity of silk for forming its cocoon, are no less than one foot long, whilst in the goat caterpillar they are only three inches. After the cocoon has been formed, there is no further use for the silk bags, and we consequently find them rapidly contracting till they entirely disappear, which takes place when the pupa is eight days old, at which time the honey-bag mentioned above begins to be formed.

It must be remarked that *all* caterpillars require some amount of silk, even though they do not form a cocoon; for, when young, most of them have a supply of silk for the purpose of breaking their fall from the plant on which they feed, and all without exception require a small quantity whenever they change their skin. At those times they spin a small web, in which they fasten their pro-legs, so as to retain the old skin and enable the animal to creep out of it, otherwise it would die. Inexperienced persons frequently remove their caterpillars from plant to plant, without allowing them to walk from one to the other, thereby not only injuring them by the rough handling, but frequently also removing them from the web which they had spun; in either case insuring, as certainly as possible, the death of the animal.

I remarked above that insects were without blood-vessels, and this leads me to say a few words about the *Circulatory system*. In man and the higher animals the heart is divided into four chambers, the two upper called *auricles*, and the two lower *ventricles*. The blood passes from the right ventricle to the lungs, where it is spread out, as it were, by being made to pass through numerous small channels called *capillaries*, and is thus exposed to the influence of the external air, whereby it is purified; it then passes out from the lungs to the left auricle of the heart, thence to the left ventricle, which propels it to all parts of the system. It is then collected by the veins and carried back to the right auricle, and thence to the right ventricle, whence it proceeds as before to the lungs. In this way we see that the circulation depends on the heart, and in order therefore to understand the circulation in any animal, we must examine its heart. Now till very recently it was a matter of doubt whether insects had any circulation at all. A large vessel was seen to lie along the whole length of the back, and in those insects, whose skin was sufficiently transparent, this vessel was observed to contract at regular intervals; but then there were no veins or arteries observed to proceed from this vessel, and hence Cuvier concluded that it was no heart, but merely a receptacle for some secretion. This opinion was still more strengthened by the assertion of Marcel de Serres, that it could be totally removed without the immediate death of the insect. But still, circulation had been seen to go on in various parts of insects, and the question remained still unsettled, though the "peculiar provision for the conveyance of air through the interior of their bodies was supposed to render such movement of blood unnecessary." But there is really a proper circulation in insects, and it is in consequence of their wonderful energy that the provision of respiration peculiar to them is necessary, no proper aeration of the blood being possible if their respiration had been placed in one organ.

In the *larva* this vessel has but few partitions, and extends nearly the whole length of the animal. In the imago state it is much shortened and more concentrated. The real course of the blood is this: it is forced forward from behind by contractions of this large dorsal vessel, thence by means of vessels or spaces in the body, called *lacunæ*, to the different parts of the body, and then oozes (as it were) through the tissues to spaces round the *trachea*, whence it is conveyed to regular channels, which return it to the heart.

I now proceed to the *respiratory system*. In my former paper I called your attention to a number of holes along the *sides* of the caterpillar, which I said were *spiracles*, and were connected with a series of tubes inside the animal. These tubes branch out in all directions, and penetrate every part of the body, thereby serving the purpose of lungs, by allowing the atmospheric air to purify the circulatory fluid; these tubes, moreover, not only communicate with one another, but also with two large tubes running the whole length of the body, placed one on each side near the spiracles, with which they communicate by short straight passages. I may here mention a very curious arrangement for keeping these tubes or *tracheæ* always open. As the animal bends its body about in all directions, it would be sure to press the tubes, and thus stop the circulation; but just as we place inside an india-rubber tube a spiral wire to prevent its being stopped, so do we find in these tracheæ a fine spiral thread answering the same purpose, extending to its minutest ramifications.

Just as the larva is passing into the pupa state, the large tracheæ expand at intervals, which ultimately become sacs of considerable size. The efforts which the animal makes at the moment of transformation to rupture its skin by the distension of its body, appear to contribute towards the expansion of these sacs. One remarkable portion of the tracheal system, viz., that which forms the wings, now shows an increased tendency to prolongation. These wings are really therefore a part of the respiratory apparatus (however much it may be stated to the contrary), as the gills of an aquatic insect, or of the very young tadpoles of the newt, the only difference being that in the moth they are covered over with an expanded part of the outer covering. During the first change of the privet hawkmoth, as observed by Mr. Newport, the wings, which at the moment of slipping off the larva skin were scarcely as large as hemp seeds, have their tracheæ distended with air, and at each inspiration of the insect, are gradually prolonged over the trunk. The enlargement of the tracheæ may also be observed in the the antennæ, which just before the change were coiled up within the sides of the head, but are now extended along the sides and abdomen. The complete change of the breathing apparatus only takes place, however, at the time of the last change, when the wings become fully distended with air. Then, too, do the *sacs* referred to above attain their full development. It may be frequently noticed that moths do not for some hours, or even days, attempt to move from the place which they had once taken up. When urged to move, they at length make a few deep inspirations, their wings become fully expanded, and then they entrust themselves to the element intended for their habitation.

How remarkable then are the changes and adaptations of the breathing apparatus; without going into the complicated plan adopted with the vertebrates, these animals, so low in the scale of creation, are supplied with an amount of breathing power, corresponding to their great energy, by a simple extension of the plan adopted in animals lower in the scale than themselves, and corresponding to their limited circulation. When the animal attains its perfect state, additional means are given it for breathing by making these large air sacs, thereby not only allowing more air, but considerably diminishing the weight of the body, and making it more suitable for its aerial existence.

It remains for me to say a few words on the *muscular* system. All muscles may be classed under two heads—those which enable us to extend or move any portion of our body from its proper position of rest, and those which enable us to bring it back again. The real action of a muscle is by *contraction*, so that for every movement of our body we require at least two sets of muscles. Now in the human frame, in order to enable us to perform all the various movements of which our body is capable, 529 muscles are sufficient; but in the caterpillar of the Goat-moth Lyonet counted no less than 4061! so elaborate are the means for enabling this creature to move. Every part of the body is most plentifully supplied with muscles, and those surrounding the intestines are really beautiful objects, in their arrangement presenting the appearance of a delicate piece of lace. "Some run longitudinally, others transversely, others crossing each other obliquely, so as to form patterns of squares or rhomboids; others again surrounding the intestine like so many rings, and almost all exhibiting the appearance of being woven, and resembling fine lace —one pattern ornamenting one organ, another a second, and another a third." In fact, those surrounding the intestines are no fewer than 2186 in number.

Such then is a brief sketch of these marvellous changes. It may be as well to conclude with a few words on the light and heat observable in insects. The insects which we see to be luminous belong principally to the beetle tribe, though it has been conjectured that as the use of this light is probably to attract the sexes (which are therefore attracted by light) therefore, as moths are attracted by light, it is quite possible for some of them to emit light, but in too feeble a degree for us to perceive. As to the *cause* of this luminosity, it does not arise from phosphorus, or, at all events, in any appreciable degree; it results from combustion; if the trachea which supplies the luminous sac be closed, so as to prevent the admission of air, the light ceases, but if the sac be raised without injuring the trachea, the light is not interrupted. If the movements of the animal are very energetic, the light is increased in brilliancy, and if the luminous segments be separated from the rest of the body, they continue phosphorescent for some time.

As regards the evolution of *heat* there is not much to be said. In the larva state the temperature of the body is seldom more than ½° to 2° warmer than the air; but in the perfect insect (when excited) it is as much as 5° to 9° above it. Among Lepidoptera, the butterflies and those moths which spend the greater part of the day on the wing evolve the greatest amount of heat; next to them the sphinges and night-moths; but it is among the insects which live in societies that the greatest amount of heat is evolved, but into that portion I cannot enter, as my paper refers to Lepidoptera only.

There were forty-seven present.

MEETING HELD NOVEMBER 10TH, 1865.

EXHIBITIONS:—

BY THE PRESIDENT.—A living specimen of the Long-eared Bat. Boxes of Brazilian Lepidoptera and Coleoptera; among the latter were the Diamond, Rhinoceros, Elephant, and Tiger Beetles. Madrepores from S. Devon; *F. Goldfussia, A. Pentagona, S. Pengellii, &c.*

BY J. C. RICHARDS.—A Necklace, formed principally of cloves, made by the natives of the Pacific Islands.

BY A. MARSHALL.—Specimens of Foreign Seeds, including the Litchi (*N. Litchi*), from China and the E. Indies; the Suwarrow Nut (*C. Butyrosum*) from Demerara; both fruits highly esteemed as delicacies.

BY A. C. ALMACK.—Series of Dried Ferns; Caterach, Maiden's Hair, &c., &c.

THE PRESIDENT placed on the table the last numbers of the Zoologist, Entomologist, Entomologist's Monthly Magazine, Journal of Botany, Magazine of Natural History, and Intellectual Observer.

H. A. HOLLAND then read a paper on BEETLES.

There were forty-seven present.

MEETING HELD NOVEMBER 24TH, 1865.

EXHIBITIONS:—

BY THE PRESIDENT.—A box of Brazilian Moths, among which were the Window moth, the Crimson-speckled footman (*D. Pulchella*), &c., &c. Bird's Nest from S. Africa, suspended from boughs to avoid the attacks of snakes. *X. Carpophylla* and *C. Coralloides* (*Fungi*), the latter edible. Carapace of the Land Tortoise from Brazil, showing how it consists of the ribs united together, and placed outside the animal's skin.

By J. Pole.—A box of French Lepidoptera, exhibiting many species found in England; among them were the Camberwell Beauty (*V. Antiopa*), Queen of Spain (*A. Lathonia*), &c., &c.

By A. Marshall.—A box of Butterflies from the Gold Coast of Africa. Humming-bird Hawk-Moth, caught as late as November 10th, being the last specimen observed this year.

By T. W. Davies.—Skin of a Chinchilla, an animal about the size of a rat, and remarkable for its extremely beautiful skin. It is a native of Chili.

By W. W. Dayman.—The Bombyces of the College Entomological collection.

By C. E. Powell.—Specimens of Madrepores from the Coast of Devonshire.

The following paper was read by W. W. Dayman, on

"THE HABITS AND HOMES OF THE BRITISH LEPIDOPTERA."

In the paper which I am about to read to-night I shall have two main points to follow, viz.: 1st, a description of the life of the animals that form its subject; and 2nd, the various modes of capturing them in all their stages.

First, to proceed to their life and history. I need hardly tell members of this Society that the round of a butterfly or moth's life is from the egg to the caterpillar (or *larva*), from the caterpillar to the chrysalis (or *pupa*), and from the *pupa* to the perfect insect, or in entomological language, *imago*, which in its turn lays the *egg*. I mention these simple facts because a friend of mine asked me a few days ago whether the butterfly did not lay the chrysalis, and, on my indignant denial, said apologetically "Oh no, of course, I meant it laid the caterpillar!" The egg of a moth or butterfly is formed of various shapes, sizes, and colours (some being ribbed or smooth, others hemispherical or spherical, and others cylindrical) and of a green, brown, or dusky white colour. There is very little to say about them in comparison with the other stages of the insect's life, and I will therefore pass on to the caterpillar, merely remarking that a study of these eggs under a microscope is well worth the trouble of procuring them; and that they possess extraordinary vitality, neither baking or freezing producing any other effect than making the exclusion of the young caterpillar earlier or later. The caterpillar on its exclusion from the egg immediately shows its knowledge of its business in the world by eating voraciously. In many instances it devours the empty shell from which it has just emerged. So enormously does it eat, and consequently so fast does it grow, that it has been found to have eaten as much as 40,000 times its own weight of green leaves during a space of about two months at the most. In fact, the sole purpose of its life seems to be to eat, sleep, and occasionally drink. Caterpillars, as we have heard before, moult about eight or nine times before assuming the pupa state, and this is generally a very trying time for the insect, and great numbers die in undergoing the change, which extends, as we know, to the internal as well as the external parts of the body. For some days before changing its skin the animal ceases to eat, and assumes a sickly appearance, till at last, generally after some violent contortions, the skin splits on the back and gradually widens, extending down the insect, when the animal creeps out of its slough quite weak and damp. Strength, however, soon returns to it, together with its eating propensities, and it makes up for the loss of time by a tremendous onslaught on the nearest food. The great enemy of the caterpillar is the Ichneumon fly, which lays its eggs always on the body of a living caterpillar, and nowhere else; these eggs produce little grubs which devour the unhappy animal internally, but carefully avoid touching any vital part till the insect is on the point of entering the pupa state, when they devour the vitals of the caterpillar, turn to pupæ themselves in the empty case, and come out about the same time as the insect would have done, to the great delight (?) of the collector, who has been anxiously expecting the appearance of some rarity he has been engaged in rearing for the last six months. The Ichneumon is its chief enemy, but the caterpillar has innumerable other foes in the shape of birds, mice, beetles, wasps, &c., &c., which are perfectly necessary to keep down this enormous family, which otherwise would devour everything green, since one moth will produce from 1500 to 3,000 eggs.

It would be endless to describe the strange shapes of caterpillars which are known, but a few may be instanced. First, the larva of the Hawk-Moth tribe is furnished with a horn, long or short, at their posterior end, the functions of which are entirely unknown, as it is not moveable. The larva of *C. Vinula*, the Puss Moth, is furnished with two horns from which proceed two rose-coloured tentacles, supposed to be used as whips to drive away Ichneumons, &c., &c. The Caterpillar of *O. Antiqua*, "The Vapourer," has a number of tubercles of hair on its back, and if irritated these hairs give out an acid that makes the hands and face of the incautious captor rise into painful swellings. The butterflies however exhibit the greatest number of peculiar larvæ, if their small number be considered. The larvæ of the Skipper, Copper, and Blue Butterflies are all wood-louse shaped; the Fritillary and most of the *Vanessidæ* are spiny, the caterpillar of the Purple Emperor (*A. Iris*) is like a green slug with a forked head; while the Swallow-tail (*P. Machaon*) has a larva which, if irritated, throws out two tentacles from the head or the segment behind the head, which were previously perfectly invisible. These are but a few instances of peculiarity in shape, and a paper might easily be written on that subject alone. The food of caterpillars consists of leaves, fungi, pith of trees and plants, lichens, grain, &c., and there is not a plant that has not some species that feeds upon it, even to the laurel, which, in its fumes, is the most fatal agent of destruction to the Lepidoptera. I will proceed first to speak of the leaf-feeders, not including in this term the insects that mine the interior of the leaf, and which I shall speak of presently. The animal's mode of eating is as follows:—It guides the edge of the leaf between its anterior legs, and then stretching out its head takes a semicircular bite; this it repeats, drawing its head nearer to its body at every fresh bite, and thus leaves a large semicircular gap in the leaf. The other caterpillars, such as the odoriferous Goat Moth, the Wood Leopard, and the whole family of the Clearwinged Hawk Moths burrow in the wood of trees, making long galleries in them, in which they turn to pupæ. The larvæ again of the Footmen or *Lithosidæ* eat lichens upon walls, trees, palings, &c. There is an immense family, the *Tineina*, many of the caterpillars of which make long galleries between the two skins of leaves, and which occasion the blotches and streaks so often observed on plants. Some larvæ (about two or three only are known) have a cannibal taste, devouring their own kind, even their own species, preferring them indeed greatly to any other food, and there are few more disgusting sights to any eyes than one of these larvæ calmly devouring an unhappy and writhing victim, which it has seized tight by the neck, regardless of its struggles. Probably, however, the animal thus operated upon feels scarcely any pain or even none, according to recent experiments, which prove the very low degree of sensibility existing in the inferior orders.

The *Homes* of Caterpillars are of innumerable kinds. A few of the more typical forms may be mentioned. The majority of caterpillars live exposed to all dangers but some contrive the most wonderful nests; some feed between united leaves of plants, tied together by silk threads, or in rolls of leaf similarly bound up; others go about in a case of shell and earth, &c., like the caddis-worms so often seen at the bottom of pools of water. Some are gregarious, and some again solitary. The gregarious larvæ either feed in a web altogether like the Small Ermine, or exposed, and in marching order, as the Procession Moth and the Bufftip (*L. Bucephala*). Some feed on the stems of seeds, and others live inside the fruit and ovaries of flowers and trees. In a word there is scarcely a place where larvæ do not contrive to live, and not a plant on which they do not feed. Caterpillars have few diseases; there are, however, one or two, such as a sort of mildew, which sometimes grows upon them, but as a rule they are liable to few attacks of disease even of a *biliary* nature.

I will pass on to speak of the *Pupa* or *Chrysalis*, the latter name being given to it from the golden spots visible on the pupæ of some of the *Vanessidæ*. It has likewise received the name of *Aurelia* from the same reason. This subject is not so wide a one as the part relating to larva, and will therefore occupy me but a short time. The pupa may be said to be the larva after its last moult, and when it first appears its skin is soft and of a light yellow hue, which afterwards deepens into a horny dark brown or black substance. Some larvæ turn into the pupa in a cocoon of silk, either pure or mixed with other substances, such as earth, wood, and hair from its own body. A very large number again make no cocoon properly so called, but simply descend into the earth to the depth of an inch or two, and turn into pupæ, either in a hollow chamber of earth, or in a very slight cocoon mixed with earth. Among cocoons proper may be mentioned that of the Emperor moth (*S. Pavonia minor*), which is flask shaped, consisting of two layers of stout silk, one inside the other. The flask end has the ends of the threads turned outwards all round, so as to prevent the ingress of any animal, while it is easily opened by the animal inside when the time for emergence is come. The cocoon of the Drinker (*O. Potatoria*) is spindle-shaped, that of the Eggars egg-shaped (whence their name.) The cocoon of the Puss moth (*C. Vinula*) together with those of the other species of its genus is hard and firm, composed of bark and glue, and so closely resembling the tree on which it is fixed that an unpractised eye is readily deceived. With this short account of pupæ I will now pass on to the *Imago* or Perfect Insect. This stage of the animal's life is naturally the one which attracts our greatest attention and admiration, from the great beauty of form and colour displayed, far excelling even the caterpillar in most instances; and here I might observe that there seems to be no affinity between the colours of the caterpillar and those of the insect it produces. In some cases however, as in that of the common Currant Moth (*A. Grossulariata*) and its family, the colours of the caterpillar, viz., white, black, and yellow, are displayed in the moth, and in much the same proportion and arrangement; but on the other hand, the caterpillars of the gorgeous Tiger Moths are merely black and brown, such as the common Woolly Bear (*A. Caja*), and, conversely, the larva of the dull-coloured Swordgrass Moth (*C. Exoleta*) is covered with the brightest emerald-green, yellow, and scarlet, forming a most dazzling object. The duration of a butterfly or moth's life varies considerably, some hybernating in ivy, &c., and emerging again in early spring, about the time the sallow blooms. In some instances there is a constant succession of broods throughout the year, the young caterpillars hybernating when very small, and feeding up in the spring.

A butterfly or moth cannot strictly be said to have any "*home*," though it has "*habits*." In wet or windy weather they creep down into the grass or into the thickest bushes, or settle on tree-stems and fences, on the lee-ward side (a royal moth preserve), and a search in such places is one of the best means of obtaining rare insects. The food of the perfect insect consists solely of the saccharine juices of flowers and ripe fruits. I might go on to speak at length of the instincts they show, and of the strange functions which their antennæ,&c., appear to possess, but my space precludes the possibility of this. There are certain distinctive habits in almost every separate family or in separate members of that family. Thus the whole family of the Footmen (*Lithosidæ*) feign death immediately they are captured, a peculiarity however shared by numerous other species. The Purple Hairstreak (*T. Quercus*), is always flying round the tops of oak and ash; often in company with the Purple Emperor (*A. Iris*). The silver-washed Fritillary (*A. Paphia*) has a penchant for settling on brambles to the great detriment of a collector's net, and such instances may be multiplied *ad libitum*. The local character of many species is also a strange and unaccountable peculiarity, *e.g.*, the Marbled White (*A. Galathea*) may be found perhaps in the corner of one field season after season, and nowhere else in the whole county, though the flora in that county does not differ in the least from that of the rest of the land. The Lulworth Skipper also (*H. Actæon*) is only found in these spots in England, though it swarms there, viz., Lulworth Cove (whence its name), and the Burning Cliff, both on the Dorsetshire Coast, and at Sidmouth, further down in Devonshire, but these are only a few of the many cases which may be cited in confirmation of this peculiarity.

I now come to the second part of my lecture, viz., the means of *capturing* these insects in all their stages. Beginning at the egg.

The *Egg* (of course) is laid on the young shoots, or on the bark of the plant on which the caterpillar is to feed; and the way in which they are laid is often very strange; the common Lacquey Moth (*C. Neustria*) makes a ring or bracelet round the twigs of the hawthorn. covering the eggs with a kind of cement which is an effectual protection. The only way to find eggs is to go and hunt for them on low bushes in open places in woods or on railway banks, isolated bushes being the best: they are generally placed on the under side of the leaf, or in the bud at the end of a twig or in crevices of bark.

The *Caterpillar*—There are various ways of finding these, viz., by searching for them with the eye and hand on the underside of leaves; by beating bushes with a thick stick over an inverted umbrella, which is about the best plan; by sweeping the long grass in hayfields, &c., with a stout net; and by taking a lantern as soon as it is dark and searching banks, hedges, hedgerows, shrubs, flowers, anything in short which presents a reasonable chance of success, as many larvæ feed only in the night. To keep caterpillars a gauze cage should be procured, and filled up nearly to the gauze with light sifted earth, in which should be set a few phials filled with water; in these place a twig of the food required, place the caterpillar on the twig, and leave it to itself, taking care to renew the food when necessary. The caterpillar, when the proper time arrives, will creep down and become a pupa in the earth, or will spin in the corners of the cage. Plenty of food and air are necessary for all the larger kinds of caterpillars; the Tineina, whose caterpillars for the most part mine in leaves, require very little air indeed, and may be kept in a tightly-closed tin, which will keep the leaf in which they are mining fresh, by preventing the admittance of air. Care should be taken not to over-crowd caterpillars, as in such cases they are apt to bite and injure, or even devour one another.

The *Imago.*—There are numerous ways of taking the perfect insect, the principal ones being attraction to *light*, *sugar*, *ivy-bloom*, *sallow* and *lime blossom*, &c., besides the orthodox mode of running them down with a net, which is the only mode for all the butterflies and for many moths.

Attraction at *Light.*—By this means alone many of the Bombyces may be captured in their perfect state. It consists simply in opening a window on a warm night, and placing two or more candles near it. The moths on a favourable night swarm to the light, and a most animated chase may be kept up in the room till about 1 o'clock a.m.

Sugar.—This consists in painting the trunks of isolated trees with a compound of sugar or honey or treacle and beer, with a little rum added to give it a smell. This should be laid on about an hour after sunset in summer, and an hour or so later the trees should be visited with a lantern, net, and boxes, when the moths will be found in a state of disgraceful intoxication on the sugar, and may be easily boxed.

Ivy-bloom and Sallow-bloom, Lime-blossom, &c.—These are the great natural attractions for Moths, and need only be visited a short time after dusk and the moths will be found sitting on the flowers as in the case of the sugar, and may easily be netted or boxed. Besides these attractions moths have their partialities for various sweet-smelling flowers, e.g., the Syringa, Petunia, Honeysuckle, &c., where they may be taken at dusk, or early in the morning, before sunrise.

There were forty-seven present.

MEETING HELD DECEMBER 8th, 1865.

EXHIBITIONS :—

BY THE PRESIDENT.—A cocoa-nut and husk, on which he spoke at some length. Specimens of Tin in its various states, comprising some Tin Ore, Stream Tin, Grain Tin, Block Tin, Gun Metal, &c., &c.

BY A. MARSHALL.—Seeds of various Indian plants and trees; among them specimens of the Mimosa, Gall Nuts of Bengal, Chinese Ground Nut, (*A. Hypogæa*), Custard-Apples, and others.

BY R. R. P. HILTON.—A gigantic tooth, supposed to have belonged to a horse of some remote period, found in a dry well.

BY A. C. ALMACK.—A polished specimen of Petrified Oak.

The President then showed a series of objects from the animal and vegetable kingdoms, by the aid of an Oxy-calcium Microscope.

There were forty-seven present.

MEETING HELD DECEMBER 15th, 1865.

EXHIBITIONS :—

BY THE PRESIDENT.—Two boxes of foreign insects, including the Bird-killing Spider (*M. Avicularia*), the Praying Mantis (*M. Relgiosa*), Locust, Leaf-insect, &c., Harlequin Beetle (*Phibalosoma*); Ipecacuanha and Sarsaparilla roots; specimen of Apple-wood, showing the progress of decay, owing to bad pruning, together with a specimen of shaky timber; series of Brazilian Ferns, including some specimens of Tree-fern; Peat in its different stages, exhibiting its gradual transition to the state of coal.

By A. Herklots.—An enormous specimen of the Puff-ball found near Barton Farm.

By A. C. Almack.—Cornish Diamond and Bearded Mussel, &c.

By J. Pole.—Pith of the Sholah Tree from Bengal, where it is used for European hats.

By C. A. Harrison.—A box of Fossils, chiefly from the chalk, collected mostly from the neighbourhood of Marlborough, and sponges from flints.

By A. Marshall.—Moths from the African Gold Coast, leaves of the *Protea Argentea*, Silk Cotton from Bombay, Ryapooth bark.

This being the last meeting of the Half-year, the Secretary gave a short summary of the proceedings of the Society during that time, and compared them with those of the last Half.

Total number of Exhibitions was	116
Ditto last Half	125
Average ditto per meeting	14·4
Ditto last Half	8
Average no. of persons present at the meetings	44
Ditto of visitors	21

The Meeting was otherwise interesting from the presence of the Rev. F. W. Farrar, one of the Harrow Masters, and late a Master at Marlborough. Mr. Farrar has recently founded a "Scientific Society" at Harrow, and at the close of the meeting he delivered an exceedingly interesting and suggestive address, comprising some account of the operations of this sister association.

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THE object of publishing the following List is not so much to show how rich the neighbourhood of Marlborough is in Lepidoptera, but rather to show how much has yet to be done ere we can profess to have even a tolerably complete List. Absence from the College during July and August, two of the best months in the year for collecting, must be our excuse for its meagreness, especially in Noctuæ; but now that its defects are known it is to be hoped that in the course of the next two or three seasons they will be greatly remedied.

Names of those whose initials are given in the following List:—

A. C. A.	A. C. Almack
W. J. B.	Mr. W. J. Baverstock
F. B.	F. Bonney
R. H. B.	R. H. Brown
J. F. B.	J. F. Buckler
E. H. D.	E. H. Davis
W. W. D.	W. W. Dayman
H. A. E.	H. A. Evans
C. R. W. H.	C. R. W. Hardy
R. R. P. H.	R. R. P. Hilton
F. C. L.	F. C. Lightfoot
J. W. L.	J. W. Lukis, Esq., quoted in Rev. F. O. Morris' "British Butterflies."
A. M.	A. Marshall
W. W. M.	W. W. Melville
J. W. M.	J. W. Mills
G. K. M.	G. K. Mills
W. G. N.	W. G. North
H. R. P.	H. R. Parrington
J. W. P.	J. W. Parrington
J. P.	J. Pole
T. A. P.	Rev. T. A. Preston
P. S. R.	P. S. Robinson
F. T. S.	F. T. Sharp
J. S.	Rev. J. Sowerby
G. T. S.	G. T. Spankie
R. H. T.	R. H. Tyacke
J. W. W.	J. W. Whitaker

LEPIDOPTERA.

[The numbers prefixed to the species refer to "Stainton's Manual."]

RHOPALOCERA.

2. GONEPTERYX RHAMNI. *Brimstone.*

3. COLIAS EDUSA. *Clouded Yellow.*

Common in 1858. Taken June, 1865, near the turnpike on the Old Swindon road, *J. W. W.* Several seen and captured the same Autumn. Variety (*Helice*), taken on Ogbourne Downs, *W. J. B.*

6. PIERIS BRASSICÆ. *Large White.*

7. P. RAPÆ. *Small White.*

8. P. NAPI. *Green-veined White.*

10. ANTHOCHARIS CARDAMINES. *Orange-tip.*

11. LEUCOPHASIA SINAPIS. *Wood White.*

Sergeant Doel's, *F. B.;* Savernake Forest, *E. H. D.;* Rabley Copse, *W. J. B.;* Rarely near Great Bedwyn, *J. W. L.*

12. ARGE GALATHEA. *Marbled White.*

Great Bedwyn, *G. T. S.*, *J. W. L.;* Savernake Forest, *E. H. D.;* seen near West Woods, *A. M.*

13. LASIOMMATA ÆGERIA. *Speckled Wood.*

Rabley, *J. W. M.*, *J. P.;* Copse near Preshute, *A. M.* This insect appears to be rather uncommon in this neighbourhood.

14. L. MEGÆRA. *Wall.*

15. HIPPARCHIA SEMELE. *Grayling.*

Sparingly near Great Bedwyn, *J. W. L.*

16. H. JANIRA. *Meadow Brown.*

17. H. TITHONUS. *Gate-keeper.*

18. H. HYPERANTHUS. *Ringlet.*

Great Bedwyn, *G. T. S.;* Plentiful on White Horse Down, *W. J. B.*

22. CŒNONYMPHA PAMPHILUS. *Small Heath.*

24. APATURA IRIS. *Purple Emperor.*

Has been taken in Savernake Forest, *W. J. B.*

25. CYNTHIA CARDUI. *Painted Lady.*

Common in 1862, 1864, and 1865.

26. VANESSA ATALANTA. *Red Admiral.*

27. V. IO. *Peacock.*

28. V. ANTIOPA. *Camberwell Beauty.*

A specimen taken near the Eight Walks in Savernake Forest, in 1860, by *W. J. B.*

29. V. POLYCHLOROS. *Large Tortoise-shell.*

Great Bedwyn, *Rev. F. O. Morris;* occasionally met with; has been taken by *F. B.* and *W. J. B.;* seen by *J. P.*

30. V. URTICÆ. *Small Tortoise-shell.*

32. ARGYNNIS PAPHIA. *Silver-washed Fritillary.*

Savernake Forest, *J. S.;* near Great Bedwyn, rather uncommonly, *J. W. L.*

33. A. ADIPPE. *High-Brown Fritillary.*

Savernake Forest, *J. S.;* taken June 21st, 1865, near the Railway Station, by — *Johnson.*

34. A. AGLAIA. *Dark Green Fritillary.*

Savernake Forest, *J. S.;* near Great Bedwyn, *Rev. F. O. Morris;* near the Railway Station, June 19th, 1865, *J. W. W.*

36. A. SELENE. *Small Pearl-bordered Fritillary.*

Savernake Forest, abundant.

37. A. EUPHROSYNE. *Pearl-bordered Fritillary.*

Savernake Forest, abundant; Rabley Copse, West Woods, and Manton Copse, abundant.

38, MELITÆA CINXIA. *Glanville Fritillary.*

Near Great Bedwyn, "very rarely," *J. W. L.*

39. M. ATHALIA. *Heath Fritillary.*

Near Great Bedwyn, *J. W. L.*

40. M. ARTEMIS. *Greasy Fritillary.*

Abundant on a bank at Clatford Bottom; near Great Bedwyn, *Rev. F. O. Morris.*

41. NEMEOBIUS LUCINA. *Duke of Burgundy Fritillary.*

Manton Copse and Rabley Copse, common in May; West Woods, *W. J. B.;* rather uncommon near Great Bedwyn, *Rev. F. O. Morris.*

42. THECLA BETULÆ. *Brown Hairstreak.*

Near Great Bedwyn, *Rev. F. O Morris;* West Woods, *W. J. B.;* seen, but not captured, in the Wilderness in the College Grounds, by *J. P.*

45. T. QUERCUS. *Purple Hairstreak.*

"Not commonly," near Great Bedwyn, *Rev. F. O. Morris*

46. T. RUBI. *Green Hairstreak.*

Clatford Park Farm, May 28, 1864, *C. R. W. H.;* near Great Bedwyn, *Rev. F. O. Morris.*

47. CHRYSOPHANUS PHLŒAS. *Small Copper.*

51. Polyommatus Alsus. ***Bedford Blue.***

Abundant in Clatford Bottom; near Great Bedwyn, *J. W. L.*

53. P. Arion. ***Large Blue.***

Savernake Forest, not Marlborough Downs, as stated in "Young England," *W. J. B.*

54. P. Corydon. ***Chalk-hill Blue.***

Rainscombe Park, *W. J. B.*; near Great Bedwyn, *J. W. L.*

56. P. Alexis. ***Common Blue.***

58. P. Agestis. ***Brown Argus.***

Moderately common.

60. Thymele Alveolus. ***Grizzled Skipper.***

61. Thanaos Tages. ***Dingy Skipper.***

Savernake Forest, *H. A. E.*; Great Bedwyn, *T. A. P.*; Martinsell, *J. W. M.*; Clatford, *H. A. E.*

64. Pamphila Linea. ***Small Skipper.***

West Woods, *J. W. M.*; Savernake Forest, *G. K. M.*; Martinsell, *W. J. B.*; not so common as the following, *H. A. E.*

65. P. Sylvanus. ***Large Skipper.***

Common in most Copses.

66. P. Comma. ***Pearl Skipper.***

Martinsell, *W. J. B.*; one specimen taken there by *J. F. B.*

HETEROCERA.

67. Procris Statices. ***Green Forester.***

Clatford Bottom; Ogbourne water-meadows, *W. J. B*,

71. Anthrocera Loniceræ. ***Large Five-spot Burnet.***

One specimen taken in 1865, at Clatford (?), *J. P.*

72. A. Filipendulæ. ***Six-spotted Burnet.***

Clatford Bottom, abundant.

73. Smerinthus Ocellatus. ***Eyed Hawk.***

Savernake Forest, *F. B.*: Forest Hill, *W. W. D.*; meadows near Back Lane, *W. J. B.*; Larva found by *H. R. P.*, and Larvæ found in Manton water meadows, *J. F. B*, and *H. A. Williams.*

74. S. Populi. ***Poplar Hawk.***

75. S. Tiliæ. ***Lime Hawk.***

Trees in Court of the College, *W. J. B.*; bred from pupa found near Mildenhall, *H. A. E.*

76. Acherontia Atropos. ***Death's-Head Hawk.***

One specimen taken in the Master's Lodge, in 1858; five or six reared in 1859 or 1860, *W. J. B.*; and one taken in Mildenhall Church, in 1865.

78. Sphinx Ligustri. *Privet Hawk.*

Plentiful occasionally; one Larva on Ash in 1865.

85. Chærocampa Elpenor. *Elephant Hawk.*

Larva found by *Rev. R. W. Dell,* in his garden, in 1865.

86. C. Porcellus. *Small Elephant.*

College Gardens, plentiful in 1858, *F. B.*

87. Macroglossa Stellatarum. *Humming Bird.*

College Court, October 1st, 1861, *J. P.*; common in 1865; specimen taken at Preshute as late as November 24th.

89. Sesia Bombyliformis. *Narrow-bordered Bee-Hawk.*

Osier bed near Marlborough College, *W. J. B.*

91. Sphecia Bembeciformis. *Lunar Hornet.*

Osier bed near Marlborough College, *W. J. B.*

104. Hepialus Lupulinus, *Common Swift.*

105. H. Humuli. *Ghost.*

107. H. Sylvinus. *Orange Swift.*

Taken by *A. M.*

110. Cossus Ligniperda. *Goat.*

Found occasionally; abundant, *W. J. B.;* Larva found in 1863, by *G. K. M.* and *W. W. D.*

114. Cerura Vinula. *Puss Moth.*

One taken near the College by *F. B.;* and a second near the "Ailesbury Arms," at Clatford, in 1865, by *W. G. N.*

118. Notodonta Ziczac. *Pebble Prominent.*

Larva taken by *G. K. M.*

126. Lophopteryx Camelina. *Coxcomb Prominent.*

Larva taken in Savernake Forest, in May, 1865, by *W. W. D.*

129. Diloba Cæruleocephala. *Figure-of-Eight.*

Larva common; specimen taken by — *Lloyd.*

130. Petasia Cassinea. *Sprawler.*

Larva common in the Forest, *W. W. D.*

135. Pygæra Bucephala. *Buff Tip.*

Mildenhall Borders, *J. W. W.;* Larva taken by *A. M.*, and at Poulton by *T. A. P.*

139. Dasychira Pudibunda. *Light Tussock.*

Occasionally met with, but by no means common; specimens have been taken or bred by *F. B.* and *F. T. S.*

141. Orgyia Antiqua. *Vapourer.*

Marlborough College, *F. B.*, *J. P.*, and *A. M.*

142. O. Gonostigma. *Scarce Vapourer.*

One specimen taken by *W. J. B.*

147. Porthesia Auriflua. *Gold-Tail.*

148. Miltochrista Miniata. *Red Arches.*

Plentiful in Savernake Forest, *W. J. B.*

153. LITHOSIA COMPLANULA.

158. GNOPHRIA RUBRICOLLIS.

Marlborough, *R. H. B.;* Manton Copse, *P. S. R.;* Mildenhall Borders, *W. W. D.;* also taken by *J. P.* and *A. M.*

164. EUTHEMONIA RUSSULA. *Clouded Buff.*

Savernake Forest, *P. S. R.*

165. ARCTIA CAJA. *Garden Tiger.*

167. NEMEOPHILA PLANTAGINIS. *Wood Tiger.*

Forest Hill, *F. B.;* West Woods, *J. W. M.;* very common in the former locality in 1865.

168. PHRAGMATOBIA FULIGINOSA. *Ruby Tiger.*

Bath Road, *F. B.;* near the College, *T. A. P.* and *F. C. L.;* abundant at Green Hill, *W. J. B.*

169. SPILOSOMA MENTHRASTI. *Large Ermine.*

171. S. LUBRICEPEDA. *Spotted Buff.*

172. DIAPHORA MENDICA. *Muslin.*

Not unfrequent.

173. CALLIMORPHA JACOBÆÆ. *Cinnabar.*

Not unfrequent.

177. LASIOCAMPA RUBI. *Fox.*

Larva taken by *G. K. M.*

179. L. QUERCUS. *Oak Eggar.*

Common, *W. J. B.*

181. PŒCILOCAMPA POPULI. *December Moth.*

Larva found on Oak near Savernake Forest Cricket Ground, in 1865, *W. W. D.;* specimen taken December 9th, by *J. J. Pulleine, Esq.*

185. ODONESTIS POTATORIA. *Drinker.*

186. GASTROPACHA QUERCIFOLIA. *Lappet.*

Larva taken by the side of the Bath road in 1858, by *F. B.;* plentiful in that year, *W. J. B.*

190. CILIX SPINULA. *Chinese Character.*

Taken by *J. P.* and *A. M.*

193. DREPANA FALCATARIA. *Pebble Hooktip.*

Savernake Forest, 1865, *W. W. M.* and *J. P.*

194. D. HAMULA. *Oak Hooktip.*

Taken by *J. P.*

195. D. UNGUICULA. *Barred Hooktip.*

Savernake Forest, 1865, *W. W. D.*; and *J. P.*

211. CYMATOPHORA FLAVICORNIS. *Yellow Horned.*

Probably not unfrequent.

212. C. RIDENS.

Larva found in Manton Copse, 1865, *W. W. D.;* caught on the Bath road, *A. M.*

213. Bryophila Perla.

Preshute, *A. M.;* probably common in July.

217. Acronycta Psi. *Common Dagger.*

Probably common.

220. A. Megacephala.

Has been taken by *A. M.* and *J. F. B.*

222. A. Alni.

Larva found in Manton Copse, in 1865, by *J. W. P.*

239. Leucania Impura.

College Gardens, *J. P.*

258. Xylophasia Rurea.

Bred from pupa obtained in the Cricket Field, *F. T. S.*

259. X. Lithoxylea. *Light Arches.*

Taken in the College by *J. W. M.* and *A. M.*

261. X. Polyodon. *Dark Arches.*

269. Heliophobus Popularis. *Feathered Gothic.*

281. Mamestra Brassicæ.

282. M. Persicariæ.

Taken by *A. M.*

283. Apamea Basilinea.

Frequent at light.

289. A. Oculea.

306. Agrotis Puta.

College Gardens, *J. P.*

310. A. Segetum.

312. A. Exclamationis.

329. Triphæna Fimbria. *Brown-bordered Yellow Underwing.*

College Gardens, *C. M. Bull, Esq.*

332. T. Orbona.

333. T. Pronuba. *Yellow Underwing.*

336. Noctua Augur.

Bred from Larva under moss on willows, *W. W. D.*

337. N. Plecta.

351. N. Xanthographa.

352. Trachea Piniperda.

One specimen taken by *R. H. B.* at Four Mile Copse, in 1865.

354. Tæniocampa Gothica.

357. T. Instabilis.

Bred from Pupæ found at Mildenhall, *H. A. E.*

359. T. Populeti.

Bred from Pupæ found at Mildenhall, 1864, *H. A. E.*

360. T. Stabilis.

372. Anthocelis Litura.

Taken in plenty at light, *G. K. M.* and *W. W. D.*

376. Scopelosoma Satellitia. *Satellite.*

College, *J. P.;* Larva in Savernake Forest, 1865, *W. W. D.*

384. Xanthia Ferruginea.

Taken at light, *W. W. D.*

390. Cosmia Trapezina.

393. C. Affinis.

Taken by *J. P.*

396. Dianthæcia Capsincola.

Larvæ plentiful in seed capsules of White Campion on the railway bank, *T. A. P.*

410. Miselia Oxyacanthæ.

College, *J. P.;* plentiful in the Forest.

412. Agriopis Aprilina.

413. Phlogophora Meticulosa. *Angle-Shades.*

418. Aplecta Nebulosa.

Rabley Copse, *H. A. E.*

430. Hadena Oleracea.

Bred from Pupæ on Willow, *G. K. M.* and *H. A. E.;* taken by *J. P.*

444. Cucullia Verbasci.

Larvæ taken on Mullein on White Horse Down, *W. W. D.*

451. C. Umbraticæ.

College Field, *W. W. M.* and *R. R. P. H;* Preshute, *A. M.;* also taken by *J. P.*

476. Plusia Chrysitis. *Burnished Brass.*

478. P. Festucæ. *Gold Splash.*

Poulton, *W. J. B.*

479. P. Iota. *Golden Y.*

Common, especially at light, *W. W. D.*

481. P. Gamma. *Silver Y.*

483. Gonoptera Libatrix. *Herald.*

484. Amphipyra Pyramidea. *Copper Underwing.*

Preshute, *A. M.*

485. A. Tragopogonis. *Mouse.*

486. Mania Typica.

Common; bred from Larva on Dock, *W. W. D.*

491. Catocala Nupta. *Red Underwing.*

Marlborough College, *F. B.;* Manton, *W. J. B.*

495. Euclidia Mi.

496. E. Glyphica.

West Woods, *G. K. M.*

497. Phytometra Ænea.

Savernake Forest, *J. P.* and *R. H. B.*

491. Ourapteryx Sambucaria. *Swallow-tail Moth.*

502. Rumia Cratægata. *Brimstone.*

504. Angerona Prunaria. *Orange.*

West Woods; Manton, *J. P.* and *A. M.*

505. Metrocampa Margaritata. *Light Emerald.*

507. Eurymene Dolobraria. *Scorch-Wing.*

Savernake Forest, *J. W. W.;* Manton Copse, *E. H. D.;* College bathing-place, *J. P.*

509. Selenia Illunaria. *Early Thorn.*

512. Odontopera Bidentata. *Scolloped Hazel.*

Not uncommon at light.

513. Crocallis Elinguaria. *Scolloped Oak.*

Taken by *A. M.*

515. Ennomos Tiliaria. *Canary-Shouldered Thorn.*

Two specimens taken at light, by *W. W. D.*

517. E. Erosaria.

Taken by *A. M.*

518. E. Angularia.

Manton Copse, *J. P.*

520. Phigalia Pilosaria.

Taken by *R. H. B.*

524. Amphidasis Prodromaria. *Oak Beauty.*

Savernake Forest, *R. B. Smith, Esq.*

525. A. Betularia. *Peppered.*

Bred from Pupa under Oak, *W. W. D.;* two specimens taken by *P. S. R.*, on the Hungerford and Bath roads respectively.

526. Hemerophila Abruptaria. *Waved Umbre.*

529. Cleora Lichenaria.

Savernake Forest, *J. P.*

530. Boarmia Repandata. *Mottled Beauty.*

531. B. Rhomboidaria. *Willow Beauty.*

Near Manton Copse, *J. W. M.;* taken also by *A. M.*

537. Tephrosia Crepuscularia. *Small Engrailed.*

Rabley Copse, *J. W. P.*

553. Iodis Lactearia.

555. Hemithea Thymiaria.

Manton Copse, *G. K. M.;* taken also by *A. M.*

563. Asthena Luteata. *Small Yellow-wave.*

White Horse Down, *J. P.*

564. A. Candidata. *Small White-wave.*

571. Acidalia Scutulata.

Taken by *H. A. E.* and *J. P.*

572. A. Bisetata. *Small Fan-footed Wave.*

Manton Copse, *J. P.;* taken also by *R. H. B.*

579. A. Virgularia. *Small Dusty Wave.*

Taken by *H. A. E.*

585. A. IMMUTATA.

591. A. AVERSATA. *Ribband Wave.*

Taken by *H. A. E.*

595. BRADYEPETES AMATARIA. *Blood-Vein.*

Not common.

596. CABERA PUSARIA. *White Wave.*

598. C. EXANTHEMATA.

599. CORYCIA PUNCTATA. *Clouded Silver.*

Savernake Forest, *J. P.* and *A. M.*

600. C. TAMINATA.

Savernake Forest, *J. P.; A. M.*

606. HALIA WAVARIA. *V. Moth.*

Not common.

607. STRENIA CLATHRATA. *Latticed Heath.*

608. LOZOGRAMMA PETRARIA. *Brown Silver-Line.*

Common in Savernake Forest; near Barton Farm, *J. W. M.*

609. NUMERIA PULVERARIA.

Taken by *A. M.*

613. FIDONIA ATOMARIA. *Common Heath.*

Great Bedwyn, and Heath near West Woods, *J. W. M.;* taken also by *H. A. E.*

614. F. PINIARIA. *Bordered White.*

Bedwyn Common, *J. P.*

617. MINOA EUPHORBIATA.

Not uncommon.

622. ABRAXAS GROSSULARIATA. *Large Magpie.*

623. A. ULMATA.

College Cricket Field.

625. LIGDIA ADUSTATA. *Scorched Carpet.*

Forest Hill, *E. H. D.;* taken also by *J. P.* and *A. M.*

626. LOMASPILIS MARGINATA. *Clouded Border.*

Taken by *A. M.*

629. HYBERNIA LEUCOPHEARIA. *Spring Usher.*

Manton Copse, *J. P.;* West Woods.

630. H. AURANTIARIA.

One specimen taken in Savernake Forest, *A. C. A.*

631. H. PROGEMMARIA. *Dotted Border.*

Barton Farm, *R. H. T.;* bred by *H. A. E.*

632. H. DEFOLIARIA. *Mottled Umbre.*

At light, *W. W. D.; R. H. B.*

633. ANISOPTERYX ÆSCULARIA.

West Woods and Manton Copse, *J. P.*

634. CHEIMATOBIA BRUMATA. *Winter Moth.*

644. Larentia Olivaria. *Beech-green Carpet.*

Taken at light by *J. W. P.*, *J. P.*, and *A. M.*

645. L. Miaria. *Green Carpet.*

646. Emmelesia Affinitata. *Rivulet.*

647. E. Alchemillata. *Small Rivulet.*

Manton Copse, *J. P.*

648. E. Albulata. *Grass Rivulet.*

Savernake Forest, *J. P.*; taken also by *P. S. R.*

658. Eupithecia Centaureata.

Taken by *A. M.*

678. E. Vulgata. *Common Pug.*

706. Ypsipetes Elutata. *July Highflyer.*

Barton Farm, *J. W. M.*; taken also by *R. H. B.*

708. Melanthia Ocellata. *Purple-Bar Carpet.*

710. Melanippe Hastata. *Argent and Sable.*

West Woods, *J. W. M.*; Manton Copse, *W. W. M.*

712. M. Procellata.

Manton Copse, *G. K. M.*

714. M. Rivata. *Wood Carpet.*

Folly Farm and White Horse Down, *J. W. M.*; taken also by *H. A. E.*

715. M. Biriviata. *Common Carpet.*

716. M. Montanata. *Silver Ground Carpet.*

718. M. Fluctuata. *Garden Carpet.*

721. Anticlea Badiata.

Savernake Forest, *J. P.*; Manton Copse, and at light, *W. W. D.*

722. A. Derivata.

Barton Farm, *J. P.*; taken also by *R. H. B.*

725. Coremia Propugnata.

Savernake Forest, *J. P.*; taken also by *H. A. E.* and *R. H. B.*

726. C. Ferrugaria.

727. C. Unidentaria.

Savernake Forest, *R. H. B.*; at light, *W. W. D.*

729. Camptogramma Bilineata. *Yellow Shell.*

737. Scotosia Dubitata. *Tissue.*

Common at light.

743. Cidaria Miata. *Autumn Green Carpet.*

747. C. Russata. *Marbled Carpet.*

748. C. Immanata.

751. C. Prunata.

West Woods, *J. W. M.*

754. C. Fulvata.

Bred from Larva on Dock, *W. W. D.*

761. Eubolia Plumbaria. *Belle.*

Savernake Forest, *F. T. S.*, and *J. P.*; Marlborough Downs, *J. P.*

763. E. LINEOLATA.

Marlborough Downs, *J. P.*

765. ANAITIS PLAGIARIA. *Treble Bar.*

Taken by *P. S. R.*

769. ODEZIA CHÆROPHYLLATA. *Chimney-Sweep.*

Common in Savernake Forest.

771. HYPENA PROBOSCIDALIS. *Snout.*

779. HERMINIA BARBALIS.

Savernake Forest, *P. S. R.*

780. H. TARSIPENNALIS.

West Woods, *J. W. M.*

785. PYRALIS FARINALIS. *Meal Moth.*

Marlborough College, *T. A. P.*; Preshute, *A. M.*

787. AGLOSSA PINGUINALIS. *Tabby.*

Preshute, *A. M.*; taken also by *F. T. S.*

790. PYRAUSTA PUNICEALIS. *Purple and Gold.*

Marlborough Downs, *J. P.*

791. P. PURPURALIS. *Crimson and Gold.*

Savernake Forest, *J. P.*

792. P. OSTRINALIS.

Marlborough Downs, *J. P.*, *H. A. E.*; Savernake Forest, *A. M.*

794. HERBULA CESPITALIS.

Marlborough Downs, *J. P.*

803. CATACLYSTA LEMNATA. *Small China Mark.*

Taken by *R. H. B.*, *A. M.*, and *J. E. Hilliard.*

809. BOTYS PANDALIS. *Bordered Pearl.*

Field near Railway Station, *J. P.*

812. B. VERTICALIS. *Mother-of-Pearl.*

Probably common; taken by *A. M.*; Larva by *J. P.*

817. B. URTICATA. *Small Magpie.*

821. PIONEA FORFICALIS. *Garden Pebble.*

Taken by *J. P.* and *H. A. E.*

828. SCOPULA LUTEALIS.

Rabley Copse, on nettles, *J. P.*

829. S. OLIVALIS. *White Brindled.*

Rabley Copse, *J. P.*; West Woods, *J. W. M.*

834. NOLA CUCULLATELLA. *Short Cloaked.*

Taken by *R. H. B.*

837. SIMAETHIS FABRICIANA. *Nettle Tap.*

846. EUDOREA CRATÆGELLA.

Taken by *J. P.*

857. APHOMIA COLONELLA.

Bred from deserted Wasps' Nest, *T. A. P.*

859. Achroia Grisella.

Bred from Honeycomb, *T. A. P.*

899. Crambus Pratellus.

904. C. Pascuellus.

906. C. Hortuellus.

912. C. Selacellus.

Savernake Forest, *J. P.*

913. C. Tristellus.

918. C. Perlellus.

White Horse Down, *A. M.*; taken also by *R. H. B.*

◆

The following List of Botanical Notices will give a very tolerable idea of the work done during the half-year. On our return to Marlborough, very many of the Plants had already done flowering; some notice is taken of almost every species still in flower at that time, and if, therefore, no mention is made of any particular species, it may be inferred that it was in seed by by the end of August. As regards the defoliation of the trees, it may be remarked that till November 20th most of them were still green, but the very rough weather on the 21st and 22nd completely stripped all the trees, except the oak, which continued to have some leaves for about a fortnight later. As usual, a name in italics indicates that the plant has been discovered in a new locality; those in capitals, that no notice of them has hitherto been recorded. Below are given the names of those whose initials occur in the List.

M. O. A.	M. O. Alison.
A. C. A.	A. C. Almack.
A. A.	A. Armstrong, Esq.
C. M. B.	C. M. Bevan.
L. C. C.	L. C. Calley.
W. R. C.	W. R. Carles.
J. G. C.	J. G. Crosse.
E. H. D.	E. H. Davis.
W. W. D.	W. W. Dayman.
H. A. E.	H. A. Evans.
J. G.	J. Gorton.
C. A. H.	C. A. Harrison.
R. R. P. H.	R. R. P. Hilton.
H. M. H.	H. M. Hilton.
A. P. H.	A. P. Hockin.
H. W. H.	H. W. Hockin.
E. L.	E. Lloyd.
T. E. M.	T. E. Maclean.
H. A. M.	H. A. Marsh.
A. M.	A. Marshall.
R. B. M.	R. B. Mainwaring.
W. W. M.	W. W. Melville.
J. W. P.	J. W. Parrington.
J. P.	J. Pole.
C. P.	C. Powell.
J. J. P.	J. J. Pulleine, Esq.
G. F. R.	G. F. Ruck.
P. T.	P. Thursby.
J. W. W.	J. W. Whitaker.

PLANTS.

Clematis Vitalba	Traveller's Joy, Chisbury, *H. A. E.;* Marlborough Butts, *C. A. H.;* top of the Cricket Field, *W. W. D.;* on the road to Ramsbury, half-a-mile from Marlborough, *W. R. C.*
Ranunculus acris	Upright Crowfoot, generally over by the middle of October; a specimen in flower was gathered as late as December 17th.
R. repens	Creeping Crowfoot, last specimen observed in flower, October 4th.
Caltha palustris	Marsh Marigold, in flower as late as September 20th, in Mildenhall Water Meadows.
Papaver Rhœas	Common Red Poppy, plentiful in September; a specimen gathered as late as Oct. 25th, by *H. W. H.;* a double variety gathered September 1st, on the railway bank, by *M. O. A.*, (probably an escape from some garden).
Chelidonium majus	Celandine, in flower September 12th, *A. M.*
Cardamine hirsuta	Hairy Bitter Cress, Clatford, flower and seed, August 30th.
Reseda lutea	Wild Mignonette, over by October 7th, *C. P.*
Helianthemum vulgare	Rock Rose, in flower October 1st.
Viola Odorata	Sweet Violet, cultivated specimens in flower, December 6th.
V. sylvatica	Wood Violet.
(*Var*). Riviniana	Sept. 15th, *J. P.*

(*Var*). Reichenbachiana	Sept. 14th, *J. P.*, at Manton.
V. tricolor	
(*Var*). arvensis ...	Pansy, Nov. 20th, *J. P.*
Saponaria officinalis ...	Soapwort, flowers as late as Nov. 20th; the specimens at Poulton (the only locality as yet recorded) are double varieties.
Lychnis vespertina ...	White Campion, specimens as late as October 4th, *J. W. P.*
L. diurna...	Red Campion, generally over by end of September; a specimen as late as December 8th, *E. H. D.*
Stellaria media	Chickweed, flowering again September 27th, *W. W. M.*
S. graminea	Lesser Stitchwort, still in flower September 27th, *W. W. M.*
Malva moschata... ...	Musk Mallow, in flower during September and October; last specimen observed November 7th, *A. C. A.* and *H. A. E.*
M. rotundifolia	Dwarf Mallow, flowers as late as September 27th, *T. E. M.*
Tilia parvifolia	Lime, one tree leafless as early as September 16th, *R. B. M.*; every tree leafless by November 6th.
Hypericum perforatum...	St. John's-wort; a few specimens as late as September 21st, *C. P.*
H. hirsutum	Hairy St. John's-wort, a few flowers out as late as August 30th; in seed September 17th, *J. W. P.*
Acer Pseudo-platanus ...	Sycamore, leafless by November 6th.
Æsculus Hippocastanum	Horse Chestnut, leafless by November 4th.
Geranium pratense ...	Crowfoot Crane's-bill, in full flower during September; flowers as late as October 11th, *J. G. C.*
* G. sanguineum	Bloody Crane's-bill, in flower November 3rd.
G. columbinum	Long-stalked Crane's-bill, in flower September 14th, in Manton Copse, *J. P.*
G. molle	Dove's-foot Crane's-bill, in flower October 30th, *J. G. C.*
G. Robertianum... ...	Herb Robert, generally over by the end of September; flowers as late as November 1st, *J. W. P.*

Euomymus Europæus	Spindle, seeds ripe by beginning of September.
ULEX NANUS (*Var*). GALLII	Common in Savernake Forest; flowers during October, *J. W. P.*, *J. P.*, and *P. T.*
Medicago lupulina	Black Medick, in flower September 25th, *T. E. M.* and *P. T.*
Trifolium pratense	Purple Clover, in flower November 1st, *J. W. P.*
T. procumbens	Hop Trefoil, in flower September 25th, *T. E. M.* and *P. T.*
Lotus corniculatus	Bird's-foot Trefoil, in flower September 8th, *T. E. M.*
Vicia Cracca	Tufted Vetch, flowers as late as September 20th.
V. sepium	Bush Vetch, in flower September 27th, *W. W. M.*
Lathyrus macrorrhizus	Tuberous Pea, in full flower September 20th, *L. C. C.*
Onobrychis sativa	Cock's-head, flowers as late as September 25th, *R. R. P. H.*
* Pisum sativum	Garden Pea, in flower September 27th, *W. W. M.;* on November 1st many bushels of green peas were gathered from a field which had "britted" since harvest.
Agrimonia Eupatoria	Agrimony, still in flower September 27th, *W. W. M.*
A. Odorata	Just over by September 27th, in a field near the brick-kiln on the right of the Pewsey Road, near Clench Common.
Fragaria vesca	Strawberry, in fruit September 26th. *E. L.;* much later in gardens; a dish was gathered October 14th.
Rubus Idæus	Raspberry, wild fruit ripe September 26th, *E. L.;* flowers and fruit well formed but not ripe (cultivated) October 9th, *A. A.;* a dish gathered October 28th.
R. cæsius	Dewberry, in flower November 1st, *J. W. P.*

Other species of Rubi were in flower during October.

Rosa canina	Dog Rose, a single specimen gathered October 23rd, *W. W. M.*

R. arvensis	Trailing Dog Rose, a specimen gathered October 4th by *A. P. H.*, and another November 10th.
Cratægus Oxyacantha	Hawthorn, leafless by November 22nd.
	Apples and Pears in gardens leafless by November 13th.
Epilobium parviflorum	Small-flowered Willow-herb, a few specimens still in flower September 9th.
E. montanum	Broad-leaved Willow-herb, flowers as late as September 19th, *J. G. C.*
Bryonia dioica	Red Bryony, a few flowers September 18th, *A. P. H.*
Spergula arvensis	Corn Spurrey, still in flower September 27th, *J. J. P.*
Ægopdoium Podagraria	Goutweed, in a small Copse near Clench Common.
Pimpinella Saxifraga	Small Burnet Saxifrage, still in flower December 3rd, *R. B. M.*
Æthusa Cynapium	Fool's Parsley, generally over by the end of August; a specimen in flower November 25th, *C. M. B.*
Heracleum Sphondylium	Hogweed, still in flower November 10th.
Hedera Helix	Ivy, first flower September 19th, *J. W. W.*
Cornus Sanguinea	Dogwood, in full flower during September; last flower observed October 19th, *L. C. C.*
Lonicera Periclymenum	Honeysuckle, flowers as late as September 24th, *P. T.* and *T. E. M.*
Sherardia arvensis	Field Madder, flowers October 9th, *G. F. R.*
Galium cruciatum	Crosswort, last flower observed September 27th, *H. A. E.*
G. Aparine	Cleavers, in flower September 27th, *W. W. M.*
G. Mollugo	Great Bastard Madder, in flower September 20th, *J. G. C.* and *W. W. M.*; in seed October 7th, *C. P.*
G. verum	Lady's Bedstraw, last flower observed October 9th, *W. W. M.*
Valerianella olitoria	Corn Salad, Fyfield, in flower August 30th, *R. B. M.*
Knautia arvensis	Field Scabious, still in flower December 13th, *L. C. C.*
Scabiosa succisa	Devil's-bit, in flower December 20th, *J. G. C.*
* Aster sp.	Michaelmas Daisy, coming into flower September 20th.

Bellis perennis	Daisy, flowers nearly over October 3rd, *A. P. H.*
SOLIDAGO VIRGAUREA	Golden Rod, copse near Clatford Bottom, September 15th, *J. P.*
Bidens tripartita	Bur Marigold, in flower October 9th, *P. T.*
Achillea Millefolium	Generally over by the end of September; specimens were found as late as December 13th, *L. C. C.*
Chrysanthemum Leucanthemum, last flower observed October 24th.	
Matricaria Parthenium	Feverfew, double variety, hedge near Cemetry, in full flower September 10th, *R. R. P. H.* (probably an escape).
M. inodora	Corn Wild Chamomile, in flower during December.
Gnaphalium uliginosum	Common Cudweed, near Serjeant Doole's, in flower September 4th, *R. R. P. H.*
Senecio vulgaris	Groundsel, a few specimens out during December.
S. Jacobœa	Ragwort, a specimen as late as October 28th, *W. W. M.*
S. aquaticus	Marsh Ragwort, last flower observed September 2nd, *G. F. R.*
Centaurea nigra	Black Knapweed, last flower November 20th, *J. P.*
C. Scabiosa	Great Knapweed, September 17th, *J. W. P.*
Carduus arvensis	Creeping Thistle, as late as September 18th, *J. G. C.* and *W. W. M.*
C. acaulis	Ground Thistle, as late as October 24th, *M. O. A.*
Lapsana communis	Nipplewort, last flower observed September 27th, *T. E. M.*
Sonchus oleraceus	Sowthistle, Fyfield, in flower October 1st, *R. R. P. H.*
S. asper	Sowthistle, in flower October 9th, *P. T.*
S. arvensis	Corn Sowthistle, Mildenhall, in flower October 11th, *W. W. D.*
Crepis virens	Smooth Hawk's-beard, as late as November 10th.
* Helianthus tuberosus	Jerusalem Artichoke, first flower out October 7th, *Dr. Fergus.* This plant was generally in flower a few days later, showing the great warmth of that season of the year.

Campanula glomerata	Clustered Bell-flower, in flower during October.
C. rotundifolia	Hairbell, in flower during September and October; last flower observed October 30th, *J. G. C.*
Calluna vulgaris	Ling, observed on Bedwyn Common, and near Rabley Copse by *J. J. P.*
Ilex Aquifolium	Holly, red berries on October 3rd, *A. P. H.*
Ligustrum vulgare	Privet, ripe fruit, October 1st, *J. W. P.*
Fraxinus excelsior	Ash, generally leafless by November 10th, quite so by November 22nd.
Erythræa Centaurium	Centaury, Chisbury Camp, September 21st, *H. A. E.;* flowers as late as October 7th, *C. P.*
Gentiana Amarella	Felwort, white variety, September 21st, *H. M. H.;* a few flowers as late as October 1st, *J. W. P.*
G. Campestris	Field Gentian, near Ivy's Farm, September 2nd; Marlborough Common as late as October 9th, *J. G. C.*; *P. T.*
Convolvulus sepium	Great Bindweed, last flower observed September 27th, *W. W. M.*
Echium vulgare	Bugloss, still in flower September 24th, *J. G.*
Symphytum officinale	Comfrey, September 27th, *T. E. M.;* second bloom November 12th, *A. M.*
Myosotis palustris	Forget-me-not, still out September 9th, *T. E. M.*
M. arvensis	Field Scorpion-grass, last flower observed October 9th, *P. T.*
Solanum Dulcamara	Bitter-sweet, still in flower September 1st, *M. O. A.*
Hyoscyamus niger	Henbane, three miles from Marlborough along the Hungerford road, *W. R. C.;* Elcott Mill.
Orobanche minor	Still in flower September 18th, *R. R. P. H.*
Verbascum Thapsus	Great Mullein, top of Granham Hill, *W. W. D.;* Mildenhall, flowers as late as October 16th, *J. J. P.*
Linaria vulgaris	Yellow Toad-flax, in flower till the end of October; a slight approach to the Monstrosity, called *Peloria,* was found October 23rd, by *W. W. M.*
Euphrasia officinalis	Eye-bright, in flower September 4th, *R. R. P. H.;* in full seed September 25th, *J. G. C.*

E. Odontites	Red Bartsia, in flower September 25th, *J. G. O.;* White Var, in full flower found August 30th, at Preshute, by *R. R. P. H.*
Veronica Anagallis	Water Speedwell, nearly over August 30th.
V. agrestis	Field Speedwell, in flower September 21st, *J. W. P.*
Mentha arvensis	Corn mint, over by September 21st, *T. E. M.*
Thymus Serpyllum	Common Thyme, in full flower September 27th.
Calamintha Clinopodium	In flower till end of September; September 26th, *E. L.*
Prunella vulgaris	Self-heal, flowers as late as October 1st, *J. W. P.*
Lamium purpureum	Red Dead-Nettle, a few specimens as late as December 3rd, *R. B. M.*
L. Album	White Dead-Nettle, ditto.
Galeopsis Ladanum	Ironwort, in full flower during September: last flower observed October 9th, *G. F. R.*
G. Tetrahit	Wild Hemp, as late as September 20th, *J. G. C. W. W. M.*
Stachys Betonica	Wood Betony, last flower observed September 9th, *T. E. M.*
S. Sylvatica	Hedge Woundwort, plentiful in September; latest flower observed October 23rd, *J. G. O.*
Primula vulgaris	Primrose, a few flowers out as early as September 15th, *J. P.*
Anagallis arvensis	Last flowers observed September 25th, *J. G. O.*
Plantago lanceolata	Ribwort, as late as November 26th, *R. B. M.*
Polygonum amphibium	Amphibious Persicaria, still in flower September 9th, at Poulton.
P. Persicaria	Spotted Persicaria, flowers as late as September 25th, *J. G. C.*
P. Convolvulus	Black Bindweed, September 20th, *J. G. C.* and *W. W. M.*
Euphorbia Peplus	Petty Spurge, in flower September 18th, *R. R. P. H.*
Humulus Lupulus	Common Hop, fruit October 9th, *G. F. R.*
ULMUS MONTANA	Wych Elm, commonly cultivated; leafless November 22nd.
U. Suberosa	Common Elm, leafless November 22nd.

Betula glutinosa	Common Birch, leafless by November 6th.
Fagus Sylvatica	Beech, leafless by November 6th.
* Juglans regia	Walnut, leafless November 4th, *A. M.*
* Castanea vulgaris	Sweet Chestnut, leafless about September 21st, *A. A.*; fruit ripe about October 3rd, *P. T.*
Corylus Avellana	Hazel, male catkins appearing October 25th, *H. W. H.*; leafless November 6th.
Quercus Robur	Oak, the only tree not leafless by November 22nd.
Phalaris Canariensis	Canary Grass, in flower September 3rd, at Preshute, *W. W. M.*
	Rye, still in flower November 18th, *J. P.*
Scolopendrium vulgare	Hart's-tongue, walls of Marlborough College, *H. A. M.*

BIRDS.

Turdus pilaris	Fieldfare, seen November 10th, *W. R. Carles.*
Turdus musicus	Song Thrush, heard singing November 19th, *W. R. Carles.*
Turdus iliacus	Redwing, seen November 28th, *A. Dolben.*
Motacilla flava	Yellow Wagtail, a pair seen October 7th, *W. W. Dayman; A. C. Almack.*
Emberzia citrinella	Yellow-hammer, nest and young found September 23rd, *C. J. Cummings.*
Alcedo ispida	Kingfisher, seen November 15th, *A. C. Almack.*
Hirundo rustica	Swallow, left Marlborough September 27th, *H. B. Parrington.* Occasional birds seen October 1st, *W. R. Carles*; October 21st and 26th, *H. W. Hockin*; October 28th, *E. Bagot*; November 9th, *A. Hammersley*; December 3rd, *G. T. Spankie.*
Hirundo urbica	Martin, seen November 3rd, *J. Pole.*
Columba palumbus	Wood-pigeon, eggs September 6th, *C. E. Powell.*
Perdix cinerea	Partridge, egg September 23rd, *E. A. King* (it had apparently been laid some time).
Scolopax gallinago	Snipe, one seen November 20th, *A. Dolben.*
Vanellus cristatus	Peewit, a very large flock seen in the water meadows near Great Bedwyn, December 19th, *A. C. Almack.*

OBSERVATIONS ON THE WEATHER.

N.B.—The passages quoted are from Mr. Glaisher's Report of the Weather, published by the Registrar General.

The weather during the first 3 weeks of July was very unsettled, frequent showers and strong wind, and during this period harvest work progressed very slowly. The temperature rose till the 3rd, when it fell steadily till the 12th, it then rose again till it reached its maximum 82·1° on the 24th, after which it fell considerably. The mean temperature for the month was 62·0°, being only 0·3° above the average, as determined by Mr. Glashier. The dry weather towards the end of July was very beneficial to the crops, but "on the 31st the weather changed again to cold and wet; harvest work was a good deal interrupted, and up to this time no mention was made of the potato disease; but in the first week in August indications of the disease were seen both in Ireland and England."

The early part of August was very unfavourable, but from the 12th to the 25th the rain was very heavy at times, and the days frequently very stormy. The temperature did not vary to any remarkable degree, but it was a cold month on the whole, the mean temperature being 58·5°, as much as 2·8° below the average, a very large amount for this time of the year.

In September, a wonderful change took place, "the temperature was high, there was but little cloud either day or night; the sun shone with great brilliancy, harvest work proceeded simultaneously over England, Ireland and Scotland. In many places very little rain fell, not amounting in the whole month to one-tenth of an inch" (about double this quantity at Marlborough.) "The reading of the Barometer was remarkably high. The temperature frequently exceeded 80·0° at places south of 53° latitude, and in some cases to 85·0°, 86·0, 87·0°. The average daily excess of temperature for the whole month was 7½°, and proved to be the hottest month of the year," At Marlborough it only once exceeded 80·0°, viz., on the 15th, when it was 82·5°, but it was hardly ever below 70·0°, and was *very nearly* as warm as July.

"The temperature of September was remarkable indeed; back to 1771 there is no instance of one so warm; the nearest approach to this high temperature was 60·3° in 1858; 60·1° in 1846; 60·7° in 1818; 62·3° in 1815; 60·8° in 1795; and 60·7° in 1779; so that this month is more than 1½° of higher temperature than any on record."

Harvest was finished early in September, and so warm and dry was the month that hay was made for the 3rd time this year in some places.

The remarkably fine and dry weather which had prevailed in September continued during the first week in October; the Barometer reading during this time was about 30 inches (at sea level); at the beginning of the second week there were indications of a change, the temperature fell, and the barometer reading decreased on the 12th day to nearly 29 inches (on 11th at Marlboro), then increased rapidly to 29·9 in. by the 15th, and decreased to below 29 inches by the 18th day; from this time rain fell very heavily, and heavy gales of wind were experienced; the weather continued stormy to the end of the month, rain falling in abundance,"

At Marlborough this month was remarkable for the excessive amount of rain, reaching the extraordinary quantity of 7·311 inches. In one night (from 16th—17th) 1·639 inches fell. The southern counties of England alone appear to have been visited with this deluge of rain. The temperature fell considerably from the 27th of September till the 19th of October, after which it was very variable, the mean temperature for the month being 50·4°, very nearly the proper average.

"At the beginning of November there were frequent gales, and much stormy weather; at about the 10th day the weather assumed the aspect of a a more settled character, the barometer reading ascended above the average, and was nearly 30·4 inches on the 12th; from the 17th to the 22nd the barometer reading decreased very rapidly, and was 28·8 inches on the latter mentioned day; this was accompanied by a fearful gale acting with ruinous effects both on land and sea. The reading of the barometer was very unsettled during the remainder of the month."

November was a damp month, though without any remarkably large amount of rain. It was very cold at the beginning, there being ice on the 5th and 6th, but the temperature rose considerably afterwards, so that from the 20th to the 26th was a very warm period. The mean temperature of the month was 43·5°, being 0·6° below the usual average. The range of temperature was very slight, being only 1·7° on the 27th, and 2·7° on the 20th.

"The month of December opened with light S. E. winds (S. at Marlborough); the air was mild and warm. The barometer reading increased by the 11th day to 30.8 inches. About the middle of the month trees budded and daisies were in blossom. Towards the end of the month the barometer decreased quickly till it was 29 inches on the 29th, (not so low as this at Marlborough.) Frequent and violent gales occurred, causing many shipwrecks." At Marlborough the wind was generally very light indeed, except towards the end of the month. The temperature was very warm, being 2·1° above the average of the preceding 24 years.

	Mean height of Barometer.		Monthly range.		Mean temperature of air.		Mean daily range.		Maximum in shade.		Minimum in shade.		Maximum in sun.		Minimum on Grass.		Mean degree of Humidity		Mean amount of Cloud.		Amount of Rain.		No. of days on which it fell.	
	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864	1865	1864
	in	in	in	in	°	°	°	°	°	°	°	°	°	°	°	°					in	in		
July ……	29·500	29·561	0·652	0·576	62·0	60·1	22·2	22·7	82.1	80·3	41.4	38·0	145·1	128·7	34·2	30·0	87.4	65·1	6·8	4·0	2·561	0·650	16	8
August …	29·415	29·628	0·856	0·772	58·5	58.1	19·8	23·7	76.6	80·2	40·2	30·4	140·7	127·3	32·8	23·7	80.5	64·6	7·0	4.7	3·968	0·519	19	11
September	29·772	29·473	0·562	1·052	61·7	55·4	24·1	15·9	82·5	68·5	35·2	37·5	141·0	118·9	29·5	28·5	77.0	78·7	5·0	6·6	0·188	2·461	3	26
October. .	29·139	29·373	1·218	1·480	50.4	49·2	17·5	12·2	72·6	62.3	31·0	31·6	117·2	109·0	23·7	18.6	82.7	79·7	6·6	6·9	7·311	1·946	23	13
November	29·400	29·315	1·522	1·930	43·5	40·3	16·0	15·3	65·5	54·3	24·4	20·0	89·0	90.0	19·2	11.0	88·0	86·4	7·0	6·7	3.893	3·146	20	18
December	29·729	29·543	1·582	1·068	42·0	37·0	10·5	9·3	56·6	51.8	24·3	19·6	76·1	80·4	18·4	14·3	92.0	95·0	8·3	8·1	2·463	2·140	15	12
Mean……	29·493	29·482	1·065	1.146	53·0	50·0	18·4	16·5	…	…	…	…	…	…	…	…	84·6	78·3	6.8	6·2	…	…	…	…

Total amount of Rain during the six months in 1865, 20·384 inches; in 1864, 10·862 inches.
Total amount of Rain during the year 1865, 34·229 inches.

REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

FOR THE

HALF-YEAR,

ENDING MIDSUMMER, 1866.

> "Tum mihi Naturæ libeat perdiscere mores,
> Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH:
Printed and Published by C. Perkins, Times Office.
1866.

D. 28 . 12 . 66

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PREFACE.

IN several respects the half-year just past has been one of the most important passages in our Society's history. We are able to report a great deal of work done, more in progress, or in prospect; and we were never so fully justified as we are at present in regarding the Marlborough Natural History Society as a regularly established institution of the School.

Early in the half-year, certain subscriptions were sent unasked to the President, and these led to the distribution of a circular, intended to explain the origin and aims of the Society, among members of the Council and friends of the School. It may fairly be hoped that this circular, issued under the Master's direct sanction, may have contributed a good deal to strengthen our position.

The great feature of the half-year has been the formation for the first time of Sections devoted to special subjects. Sections now exist for the particular study of Botany, Geology, Entomology, Ornithology, and Archæology. Two of the heads of sections have been necessarily absent for longer or shorter periods of time; but in spite of this drawback it may be said that a thoroughly satisfactory start has been made, and that the right principle has been adopted for securing the soundest and most permanent methods of working.

Archæology, it will be noticed, is quite a new branch of operation—a generic addition to our objects. Its study was adopted after a good deal of deliberation: and there is every reason for hoping that, while displacing none of the original interests, it will develope new life among many of our members.

The Herbarium has received many and important additions; the first steps have been taken towards the formation of a library, and the cabinets for eggs and lepidoptera have been well started. A measure has for some time been in contemplation, and is now actually to be carried out, by means of which all the collections will be rendered more practically useful, as being more easily accessible. This is no less than the conversion of what is now known as the Middle Fifth Class Room into a Class Room for the Society's purposes. The central position of this room, and the careful manner in which it will be fitted up, will render this change a decided step in advance, and one which all members and friends of the Society will rejoice to see carried out.

October next will witness a critical epoch in our progress. Several old and tried friends of the Society will be leaving the School, and great care and energy will be required in getting their places fitly supplied. We cannot but hope, however, that with our present position and prospects the right spirit will be shown among rising members; and that there will be no want of activity and enterprise as each outgoing officer says in turn to his successor—

"Cursu tibi lampada trado."

LIST OF MEMBERS.

PRESIDENT.

Rev. T. A. Preston.

COMMITTEE.

A. C. Almack.
W. W. Dayman.
G. K. Mills.
F. C. Lightfoot.
R. F. Isaacson.

SECRETARY.

W. W. Dayman.

ERRATA.

In page 24, line 1, for *Stonecross*, read *Stonecrop*.
In page 25, line 2, for *M. Stellatasium*, read *M. Stellatarum*.
In „ line 4, for *Bombex Cynthia* read *Attacus Cynthia*.
In „ line 7, for *Oak-eggs*, read *Oak-egger*.
In „ line 11, for *Daulin*, read *Dunlin*.
In „ line 12, for *Roseate Tem, Leoses Tem*, read *Roseate Tern, Lesser Tern*.
In „ line 13, for *Ring-Oazel*, read *Ring-Ouzel*.
In „ line 14, for *E. H. Parr*, read *E. H. Carr*.

J. C. Richards.
A. Marshall.
H. W. Hockin.
W.
A. Herklots.
T. R. Dumergue.
E. H. Carr.

FORMER MEMBERS.

J. W. Mills.
T. W. Jones.
P. Low.
H. A. Williams.
J. W. Whitaker.
A. C. D. Ryder.
W. Koch.
P. S. Robinson.
R. H. Tyacke.
P. Aldworth.
J. W. V. Taylor.
L. G. D. Ryder.
W. W. Melville.
J. Pole.
R. H. Brown.
G. T. Spankie.
J. W. Harrison.
H. A. Evans.

REPORTS.

Midsummer, 1865.

No. in hand	9	Bound for Society	1
		Sold	3
		In hand	5
	9		9

Christmas, 1865.

No. printed	400	Supplied to Members	25
		Given away	14
		Sold	216
		In hand	145
	400		400

In addition to the donations of money enumerated in the accounts, the following donations have been received by the Society, and are hereby gratefully acknowledged:—

A minute book	by Rev. F. W. Farrar.
A pocket microscope	by R. G. Clarke, Esq.
"Recreative Science," 3 vols.	by Rev. J. M. Fuller.
The "Intellectual Observer," complete	
"Popular Science Review," complete...	
The "Geologist," 6 vols.	by Rev. T. Cornthwaite.
Geological Magazine, from its comment	

ACCOUNTS.

RECEIPTS.

	£	s.	d.	£	s.	d.
Balance in hand				£3	8	0
Subscriptions				3	8	0
Donations:						
Right Hon. T. H. S. Sotheron Estcourt	£5	0	0			
Rev. H. Bell	0	11	0			
C. Hodgson, Esq.	1	0	0			
Mrs. Norris, Epsom	1	1	0			
R. Hunter, Esq.	1	0	0			
E. Marjoribanks, Esq.	5	0	0			
Rev. H. Latham	2	0	0			
Miss Corrie	1	0	0			
W. E. Mullins, Esq.	1	0	0			
C. M. Bull, Esq.	0	10	0			
				18	2	0
By sale of Report				10	19	0
				£35	17	0

PAYMENTS.

	£	s.	d.
Printing 400 copies of Report	£14	12	6
Printing Labels and Circular	1	2	6
Contributions towards tea (10 meetings)	5	0	0
Books for Catalogue, &c., of Library	0	19	0
Balance in hand	14	3	0
	£35	17	0

With this balance of £14 3s. it is proposed to purchase a few books for the Library, and to liquidate in part the debt upon the cabinets, now amounting to £29, towards which only £1 12s. 6d. has yet been subscribed.

MEETING HELD FEBRUARY 16, 1866.

The Society passed a vote of thanks to the Rev. F. W. Farrar for the present of a Minute-book.

EXHIBITIONS :—

BY THE PRESIDENT.—Fluor Spar, with a cavity partially filled with water of crystallization, presented to the College by the Rev. J. Sowerby. Fossils from Sevenoaks Tunnel, and from a well at Epsom, presented by Mrs. Norris. Truffles (*Tuber Æstivum*).

BY A. C. ALMACK.—Jew's-ear Fungus (*Auricula Herneola-Judæ*) very rare. Water-rail, shot in the water-meadows, from Mr. Brind, Marlborough. Egg of Ortolan Bunting (*E. Hortulana*).

BY J. POLE.—Gum Copal, containing insects. It is the product of a tree, and is conjectured to be several hundred years old.

BY F. C. LIGHTFOOT.—Specimens of Jersey and English Lepidoptera, including a species of Tiger, allied to the Garden Tiger (*A. Caja*), Clouded Yellow (*C. Edusa*), *P. Bœticus*, &c.

F. E. THOMPSON, Esq., kindly offered for study a series of 200 specimens of Rocks.

W. W. DAYMAN was then elected to serve as Secretary in the place of A. C. ALMACK, who resigned.

A vote of thanks to A. C. ALMACK was carried unanimously.

MEETING HELD MARCH 2nd, 1866.

EXHIBITIONS :—

BY THE PRESIDENT.—A mass of Fir-leaves, felted together by the action of water, from the neighbourhood of Shrewsbury.

BY A. HERKLOTS.—A collection of Eggs from Scotland, including specimens of those of the Eared Grebe, Crested Grebe, Kite, Hoopoe, Golden Oriole, Capercaillie, Ptarmigan, Dunlin, Sandwich Tern, Pratincole, &c., &c.

BY H. R. PARRINGTON.—Several species of *Coleoptera*

BY A. C. ALMACK.—Specimen of Cup-Lichen.

By F. C. Lightfoot.—Skull of a Roman found in Northamptonshire, having been buried about 1500 years. *Humerus* of Man, found in St. Paul's Churchyard, London. Skeleton of Tawny Owl. Skulls of Horse, Dog, Babyroussa, and various other animals. Bone with Gelatine alone remaining. Ditto with only earthy matter remaining. Vertebrate column of Ichthyosaurus, and a gigantic vertebra of the same.

By H. W. Hockin.—The skull of a Gull, found on the beach at Hayle, Cornwall.

A paper was read by F. C. Lightfoot, illustrated by drawings made by himself, on

THE BONES AND MUSCLES OF VERTEBRATE ANIMALS.

I at first intended to have spoken about the construction of bones only, but as that would have made too short and dry a paper, I have chosen this subject, not without great hesitation, as to whether it comes within the pale of Natural History.

The most important of the hard parts of animals are, Shells, Crusts, and Bones, the two former of which are void of vitality, while the latter has every appearance of being in the possession of life. In shells hardly any animal matter is found: they have almost the same construction as marble-crust (as the lobster's or crab's claw), and possess animal matter to a small extent, whereas bones possess it largely. The earthy matter in bones is not only less in quantity, but is also of a different kind. In shells and crusts the earthy matter is carbonate of lime (better known as chalk), while in bones the lime is combined with an acid composed of phosphorus and oxygen, forming phosphate of lime. I may here add phosphorus is artificially prepared from bones, and sold in the shape of sticks. The quantity of animal matter, and consequently the hardness of the bone, varies in its different stages. In youth the animal matter predominates; in old age the earthy. On an average in mature age the proportion is about two-thirds animal matter (mostly gelatine and albumen) to one-third of earthy. Mere hardness is not all that is wanted, for were this the case, bones would be almost entirely composed of earthy matter, and would consequently be easily broken. The composition of bones, therefore, is such, that the earthy matter gives stability to the framework, on which all the other parts depend for the exercise of their several functions, while the animal matter imparts to it adhesiveness and toughness. All parts which afterwards become osseous are originally in the state of cartilage (or gristle); this is then gradually removed, and bone is deposited in its place, and ultimately in its highest state of development, the bone is hollowed out internally, and filled with marrow, or, in the case of birds, with air. Some of the human bones are completely ossified at birth, as is the case with the bones of the ear; some parts, however, remain cartilaginous in manhood, and are ossified only in old age. This is the case with the cartilage that joins the ribs to the breastbone, and so, on becoming ossified in old age, it impairs the breathing, which was formerly assisted by the elasticity of the cartilage.

The first object in laying the foundation of a skeleton, appears to be, to provide for the safety of the brain and spinal marrow. Accordingly, when other parts of the skeleton are wanting, the back-bone or spine is always present; and in the human race, and in all the other *vertebrata*, this is always the first part of the osseous structure that is developed. It is composed of a series of rings or *vertebræ*, the juncture of which varies in different classes. Each side of a vertebra, in fish, forms a cup, and, consequently, when all the vertebræ are joined, two cups are always opposed to each other, and the cavities thus formed are filled with a jelly. In reptiles the junction is of the ball and socket kind, the ball of one vertebra fitting into the socket of the other above it. The surfaces of the vertebræ in the mammalia are nearly flat; and in man, especially, between each there is a layer of tough elastic gristle, which is of great use in breaking the shocks that are sustained in running and jumping. The articulation of the spine with the skull in the mammalia exhibits one of the most peculiarly complicated pieces of mechanism that is to be met with. It is necessary to have a double hinge to enable the head to be moved sideways, and to be also moved forwards and backwards as in nodding; this is far too complicated an instrument for me to explain, so I will not attempt it. When you look at the human spine, you find it a most curious piece of mechanical art, combining the apparently incompatible requisites of strength and flexibility. This flexibility is principally caused by the number of pieces employed, which are nevertheless firmly joined together. If you try to separate the vertebræ of a hare or rabbit by main force, you will then see how firmly they are joined together.

Above the spine comes the cranium, or skull, which consists of a number of separate pieces, joined together, forming a case for the brain, like a strong arch. In the bird the head is at the end of a long neck; and to counteract the length of neck the skull is extremely light, the skull of a common fowl weighing about as much as a sixpence. In the cow and other animals, as the camel, the neck is necessarily long, and the head is also heavy; to enable them to raise their heads, powerful muscles are attached to the skull and vertebræ of the neck, and a strong ligament or cord has been provided by nature. But in the elephant the weight of the head is so enormous that the neck has been made so short as to require a proboscis or trunk, since its muscles, strong as they are, could not raise the head had the neck been long.

The collar-bone is one of the most interesting parts I have not yet mentioned. It is interesting in this way: this bone is quite perfect in man, imperfect in the lion and tiger, and wholly wanting in most of the herbiverous animals. A question immediately presents itself, What is the reason for these differences? The reason is this—This bone is only brought into use when the upper parts of the body are much used in laying hold of things, as in man, the ape, &c. It separates the limbs, and so gives them sufficient extent for action. Of what use would this bone be to a horse? Why none. When we put out our hands to prevent running against anything, the fracture or dislocation of this bone often ensues, thereby saving the fracture of the arm. But when a horse gallops down a hill the shock is much more violent, and yet no bone is broken. But what is the cause of this? The fore-legs, instead of being joined to the body by bones, are joined by two large fleshy muscles attached to the shoulder-blade. The breast-bone, which is so important in the human frame, from the ribs being joined to it, is almost rudimentary in fishes, as the heart, and gills, which correspond to our lungs, are situated close to the head. The same bone is very large in birds, on account of their wings; and in the turtle and tortoise it is so large. that it entirely covers the under portion of the body, and forms a protective covering for the animal.

When you look at the paddle of the porpoise, you would call it a bad representation of the human arm: bones may be seen corresponding to the humerus, radius, ulna, &c. of the human arm; but when you come to the fingers, a great difference is seen. The porpoise has in its longest finger *thirteen* distinct bones, while the man has only *three* in the real finger, not counting the bone in the back of the hand (the metacarpal bone). The skate's body resembles two hands largely expanded. In each of the sketches I have shewn, you can trace the great resemblance to the human arm.

The bones that form joints are firmly connected by what are called ligaments; they are also covered at their extremities with smooth gristle, to enable them to move easily on one another, and to assist this movement a kind of oil is poured into the joint. The kinds of joints are various. The *hinge* joint at the elbow, admitting only a backward and forward motion, and the *ball and socket* joint at the shoulder are the two principal ones, the latter admitting movement in all directions. The hip joint is also on the ball and socket principle, but the socket is much deeper to give greater security to the joint against dislocation, as on it hangs the whole weight of the trunk.

I have now mentioned all the most remarkable bones, and I am afraid my paper has been too anatomical. I will now say something of the muscles, being the agents by which the body is set in motion. To prove the contractile power of the muscles, the finger need only be placed at the angles of the lower jaw, and on firmly closing the jaws, this power will then be felt. The contractile power of muscles is quite different from elasticity. As Dr. Hamilton observes: "The first is an original source of power, while elasticity merely modifies its distribution. Thus, it is the elasticity of the mainspring of a watch that keeps it going for twenty-four hours, but the muscles of the hand which winds it up, is the true moving power." The muscles are generally collected into bundles, consisting of large and small mixed indiscriminately, and those used in moving the skeleton are attached to the bones, and commonly end in tendons of great strength. Professor Ehrenberg states, that even in animalcules, when these minute creatures are darting through the fluid, he has seen parts contracting which he thinks are muscular bands. In oysters, there are distinct, strong muscles, enabling them to close their shells firmly. The muscular system of the *Articulata* is exceedingly well marked, and consequently their strength is very great, *four thousand* muscular bands having been counted in one caterpillar; and to take another instance, a beetle placed under a candlestick is able to move it. Again a small insect, the *Cicada spumaria* will jump five or six feet (about two hundred and fifty times its own length) which, Dr. Roget remarks, if the same proportions were observed, is the same as if a man of ordinary stature were to vault through the air a quarter of a mile.

Muscular action has been chiefly studied in the vertebrata. Anatomists have given names to between *four* and *five hundred* muscles in the human body, but the parts of what is called a single muscle often have different and even opposite uses. Professor Grant states that in the proboscis of an Elephant there are nearly 1000 muscles. The different expressions of the human face are owing to muscular contraction, and even in the lower animals, we see that the feelings to be expressed and the parts with which they are to be expressed are in unison. A cow cannot snarl like a dog, but why is this? The answer is easy. Because the cow wants the particular muscles that the dog has, for drawing up the sides of its mouth. The muscles are arranged for the most part in sets, opposed to each other, one set to bend the limbs, and a second to straighten them; a set to lower the head, and a set to raise it; and it is said that it is by muscles that the mouth is kept in its proper place.

Some of the different modes which Nature provides for the accomplishment of progressive motion among the vertebrata are—two legs in man, the legs and tail in the kangaroo, and the tail in fishes. Her most beautiful contrivance, *flight*, has foiled all the ingenuity of man to imitate. To assist motion through the air, nature has two great ends in view—first, to lighten the body as much as possible, by making the solid parts thin and hollow, and filling them with air, (thus a skeleleton of a pelican, five feet long, is found to weigh only twenty-three ounces), and secondly, to place the muscular power in those parts which are used for motion. A flap from a swan's wing has been known to break a man's leg, and the swallow's pectoral muscles which move its wings are stronger than all the others put together, which fact may be easily accounted for when we consider that it often travels about one thousand miles a day. People whose occupations compel them to sit down much, and girls who are hard worked at school, and have not sufficient exercise, suffer greatly from the muscles which should keep the spine straight being weakened, thus allowing the spine to become crooked. Dr. Forbes states, that on visiting a certain school consisting of forty girls, he did not find one who had been at the school for two years whose spine was not more or less crooked. Mr. Shaw states, that for *one poor child, twenty rich ones* are affected; that among the poor children the proportion of boys and girls so affected is equal; but that among the rich for one boy, one hundred girls are affected. When the earthy matter predominates in bones, fracture very easily occurs. Dr. Good saw an old lady who broke both her thigh bones from kneeling down in church, and whose arm broke while she was being raised, but I suppose this is a very exceptional case.

After the Meeting a discussion was entered into on the proposal of the President that Archæology should henceforward be admitted as a branch of the Society's studies. After some observations from various Members, it was announced by the Committee that this proposal would be carried out.

It was also decided that the Members should form themselves into Sections, to join which any other Members of the School should be invited: that the object of these Sections should be to make more real progress in Geology, Entomology, Botany, Ornithology, and Archæology, by mutual assistance, and that henceforth Proceedings at the General Meetings of the Society should be regulated by the Sections, so as to make them more systematic and useful.

There were Thirty-nine persons present.

MEETING HELD MARCH 16TH, 1866.

Geology.

Oakeley exhibited a fine specimen of Trilobite (*Blumenbachii*), from the Upper Silurian at Dudley. A slab of fossils, containing among other specimens *Rhynconella*, Silurian Corals, Stems of Encrinites, &c., from Dudley. Curious sand concretion, exhibiting great resemblance to some organism. A fine specimen of "Petrified Moss," from a spring near Monmouth. (Mr. Mullins spoke at some length on the geological formation at Dudley.)

Archæology.

Oakeley exhibited a fragment of Roman pavement, shewing the cement in which the mosaic was fastened.

Mr. F. E. **Thompson** exhibited a "Simnel Cake." He entered into the origin of the name, and gave a description of Bishop's Cannings Church.

Zoology.

— **Oakeley** exhibited a box of bones, principally of the Mouse, which had been found in great numbers in a cave near Monmouth. At first sight they appeared to be fossilized.

The Rev. T. A. **Preston** exhibited Skulls of Man and Gorilla.

Botany.

The Rev. T. A. **Preston** exhibited a Pinon—the fruit of the *Araucaria*, or Monkey-Puzzler,—the seeds of which are cooked and eaten like chestnuts in Chili. Pod of Vanilla from the West Indies, being the seed-vessel of a species of Orchis.

J. **Pole** exhibited a small collection of mosses, obtained in a short time near the College.

A Paper was then read by the Rev. T. A. Preston, which he illustrated by numerous preparations of the plant, on

THE POTATO.

No plant has ever spread with such rapidity or so universally as the Potato. Introduced by Sir Walter Raleigh in 1584, it has had a very varied existence,—praised and abused in turn—but it has survived all calumny, and is now, perhaps, the most important article of food known.

The origin of the name Potato is curious. Though called by the North American Indians *Openauk*, those dwelling near Quito called it *papas*. This the Spaniards corrupted into *battata* : this again was softened by the Portuguese into *ba-ta-ta*, whence by a further process of corruption we get the name Potato.

It is needless for me to describe the appearance of the potato plant: suffice it to say that the flowers are very similar in appearance and structure to those of the common Bitter-sweet or Nightshade of our hedges, whence we know that it belongs to the *Solanum* or Nightshade family. This is an especially poisonous family, and hence we may conclude that the Potato plant itself is poisonous. As grown in our gardens this appears not to be the case, as every part of it is more or less useful for food; the young shoots, however, are found to be poisonous, containing distinct traces of the poison *solanine*, which, when eaten by cattle, causes paralysis of the hinder parts. But this poisonous property seems to depart with age, and hence we find that the green tops are occasionally eaten as spinach, and Evelyn mentions the "apples" as forming a good ingredient for salad, which, however, does not seem to be borne out by experience. The water, too, in which potatoes have been boiled, is frequently injurious to animals who drink it.

In addition to these uses of the parts of the plant which are generally thrown away as useless, it may be observed that from the leaves and flowers an anodyne medicine (for allaying pain or causing sleep) has been extracted; from the flowers, a yellow dye; from the stem, fibres equal to flax have been procured in Germany, and the leaves are often used as a substitute for or adulteration of tobacco; the stems also when burnt supply large quantities of potash; a good paper-making material has been procured from these same stems, as well as from the pulp of the "root" (to be noticed hereafter); and from the "apples" spirit and vinegar have been distilled.

But these products, though capable of being greatly increased in numbers, and obtained in far greater quantities than has hitherto been done, are perfectly insignificant when compared with what can be obtained from the *tuber*, the part which we generally use as food.

It will be necessary to describe accurately what part of the plant this is. The *tuber* is a portion of the underground *stem*, and has nothing whatever to do with the root. It is, in fact, a portion of the stem of the plant, swollen out for the purpose of containing a store of food, and is therefore really the perennial part, all the rest dying away annually. That it is a part of the *stem* and not the root, is known by the fact of its having leaf-buds, commonly called "eyes." If a potato be allowed to germinate under cover of a flower-pot, so as to be kept in the dark, the portions which usually appear as roots will be found to have assumed the character of branches, on which will be seen swollen portions, some at the tips of the branches, others close to the parent stem, easily recognisable as potatoes, though all will be covered with scales, the rudiments of leaves.

If a thin slice of potato be placed under a microscope, it will be found to consist of nothing but a mass of cells, many of them partially or entirely filled with small grains, commonly known as *starch*. But it is astonishing what an enormous quantity of water is contained in the tuber. Roughly speaking, at least three-fourths of the potato is pure water, not more than one-fifth starch, and the remainder made up of the pulp forming the cells, and various other compounds—the most important of which is *caseine*, so called from its smell resembling that of cheese. It is this part of the potato which contains nitrogen, an essential part of food necessary for forming muscle; the starch, though useful in forming fat, cannot contribute to the formation of flesh: and we see, therefore, how necessary it is to have a mixed diet of animal and vegetable food to keep us in a proper state of health. Still, as potatoes have a small quantity of this nitrogenous compound, they can support persons in health when taken in sufficient quantities, but on account of the large quantity of water in their composition, it is clear that a very large quantity of potatoes must be eaten by a healthy person in order to obtain the requisite supply of necessary food—hence those who live entirely on potatoes are generally very corpulent.

But I would now direct your attention specially to the ***starch***, as it is a most important article of commerce—no less than 150,000,000 bushels of potatoes being annually grown in America for the starch alone.

The starch is not distributed equally in all the cells—those nearest the skin having by far the greater quantity. This is important in a domestic point of view, for the thicker the parings of the potato, the greater the loss of starch, and hence the homely saying, "Pare thin the potato skin" becomes very significant.

The amount of starch, too, varies according to the time of year. Thus it has been found that out of 240 lbs. of potatoes, 23 lb. to 25 lb. have been obtained in August, 32 to 38 in September, 32 to 40 in October, 38 to 45 from November to March, 38 to 28 in April, and 28 to 20 in June. Hence, in order to secure the largest amount of starch, it will be seen that the potatoes ought to be used during the winter months.

A very curious and very interesting fact in connection with the potato disease must now be noticed. This disease, though rotting the tuber, and rendering it unfit for food, has no effect upon the starch—at least, not till the tuber itself is quite rotten. During the time of the potato disease in 1847, enormous quantities of starch were procured from the diseased potatoes, and the price of potato starch consequently went down to as low as £12 a ton, though its average price is from £22 to £24 a ton, and it has been known to be as much as £30 the ton. The late Professor Henslow used to send round a tub to the various cottages, and in this tub all diseased potatoes, as well as the diseased parts which had been cut away, were put: from this he had the starch extracted, and stored up in his kitchen, and as he himself used it in his household, the poor people not only used it themselves, but applied for it when necessary.

Manufacturers of starch will, of course, want to know the starch-making quality of the potatoes which they purchase. The Germans have the following plan:—a series of solutions of salt is prepared, of different degrees of saltness: the potatoes are then placed successively into these solutions, till the solution is found in which they just float. Knowing the density of the solution, they can tell the value of the potato.

Before leaving this portion of my subject, I will say a few words on mealy and waxy potatoes. The starch in the cells of the potato consists of grains covered with a hard skin which is insoluble in cold water, but when put into boiling water this outer covering bursts and the contents swell up into a jelly, occupying of course a much larger space than before. If, then, the potato cells are well filled with starch, these grains when properly heated will swell out and burst the cell of the potato, and thus when there is a good supply of starch grains, the potato will be completely pulverized, and present a mealy appearance. If, however, the starch grains in each cell be few in number, they will be unable to burst the cell wall, and hence a waxy potato is produced. From what was said before about the starch grains being more numerous near the skin, it follows that the outside of a potato is most mealy, and even in some cases will be the only mealy portion, the centre part being thoroughly hard.

When potato starch is used for stiffening linen, these small skins will still exist, as they have merely been burst, and consequently the starch will not be perfectly clear. The Glenfield Starch Company have overcome this difficulty by mixing with the potato starch a trace of sulphuric acid, which thereby converts the insoluble starch into the transparent substance called *dextrine.*

I will now pass on to speak of the starch itself. To give some idea of its importance, 27,000,000 pounds of starch are made annually in France alone, and we may conclude that the uses to which it is applied are very numerous. A few of these I will now endeavour to describe.

Let me, however, first explain *how* the starch is obtained. Since it is contained in the cells of the potato, the first thing to be done is to burst these cells. The potatoes are therefore carefully washed (a very important process), and rasped and mashed up into a pulp. This pulp is put into a fine sieve, and water poured upon it, which will carry all the starch grains with it, when squeezed out of the pulp, and if the water is allowed to stand a short time, the starch grains, being very heavy, will sink to the bottom. The water is then poured off, and the starch is obtained in a very tolerable state of purity. But there is still a certain amount of deleterious matter with it, and a weak solution of carbonate of soda is therefore used, which effectually removes all hurtful impurities; the starch is then dried and pounded.

It is a curious fact that however poisonous a plant may be, its starch is always perfectly wholesome; and what is still more curious is that all these poisonous properties are soluble in water, and therefore by a proper amount of washing everything hurtful may be removed. Thus the plant from which the tapioca (*Janipha manihot*) is obtained is exceedingly poisonous, but the poison can be removed by the mere process of washing.

The starch thus obtained is at first sight very similar to arrowroot, though it can easily be distinguished from it and from other starches by means of the microscope, because potato starch grains are almost the largest known. Their shape is also different, and a practised eye can tell the difference at once. But still everybody does not know this, and consequently a very large quantity of what is sold as arrowroot is nothing but potato starch. This adulteration is perhaps the least harmless of any, but the great disgrace is that the dealer sells the compound for far more than it is really worth, arrowroot being worth 2s. 6d. per lb., whereas potato starch is not worth more than from 2d. to 4d. per lb. It also requires more potato starch than of the real article to make a cup of "arrowroot," and the consumer is cheated in that way also.

Starch has the property of absorbing large quantities of water, and hence the merchant has to be careful how he pays for it. It is generally sufficient to rub a little in the hand in order to discover its dryness, but a more satisfactory way is to drop a small quantity on a hot iron or metal plate. If tolerably dry, the grains fly about, but if very damp some will burst, and the grains will form themselves into hard lumps, greatly resembling tapioca, and thus we get a second form of adulteration. Large quantities of tapioca sold in shops are merely potato starch thus prepared. Preparations of potato are also used as *Vermicelli*, and such like articles. Other preparations are made by mixing the starch with gum, &c., and in fact an innumerable number of adulterations are made, different in shape and appearance, but not in material, remaining essentially nothing but potato.

By these and similar means potato starch may if necessary be slightly altered in appearance, but even without taking this trouble a grand sounding name will generally be sufficient to afford a very ready sale for potato starch, thus *Indian Corn Starch*, *Potato Flour*, and *English Arrowroot* are generally nothing but our old friend under a very slight disguise.

Lastly, potato starch mixed with chalk and diluted with a little water forms a very beautiful and good white for ceilings. This composition has no smell, and is more durable than that ordinarily used.

Thus we see how extensively pure potato starch is used, without undergoing any process for adulteration; and when it is remembered that this article is often adulterated with gypsum, chalk, and other such substances, we can understand some of the methods by which cheating in trade has grown to such an enormous extent.

Many plans have been devised for preserving potatoes, but one of the most extensive preparations is that adopted in France, and called *polenta.* The potatoes are boiled or steamed, peeled, and then by various processes separated into coarse grains. If stored in a dry place, this polenta will keep good for a long time. It is used for thickening soups and making other food dishes of various kinds.

Another method of preserving potatoes is by cutting them into thin slices and drying them. In this form they are known by the name of *Potato chips.* When potatoes are attacked by the disease, provided they are not greatly infected, the effects of the disease may be arrested by slicing them and washing them in a very weak solution of sulphuric acid (2 or 3 per cent of acid). If the potatoes are afterwards well washed in pure water, so as to remove the acid, and then dried, they are serviceable in the form of chips.

There is really no such thing as potato *flour*, in the usual acceptation of the term. If wheat flour be put into a coarse cloth and then well washed in pure water, the starch will be removed, and a considerable quantity of a gummy substance will be left—this is called *gluten.* Now starch having no *gluten* cannot form a paste, but when mixed with corn flour it is considered by some to improve the quality of the bread: it must, however, be used in moderate quantities--if more than one-fifth of the weight of wheat flour be used, a very unpleasant flavour is communicated to the bread from the presence of potato spirit, to be noticed hereafter.

Now the great use of starch to the plant is for the purpose of supplying nutriment to the young shoot when germinating, and feeding it till it is able to take care of itself. But starch in its ordinary state is unfitted for this, and consequently when the plant begins to sprout a change takes place in the starch, and it is converted into a substance called *dextrine.* This same effect is produced in the potato when it is frost bitten; and hence germinating and frost-bitten potatoes have a sweetish but very unpleasant flavour.

This same conversion of starch into dextrine can be produced by heating it, or by the action of heat aided by a minute portion of nitric acid, and if this process be repeated or continued for some length of time, the dextrine becomes further converted into sugar; this sugar cannot be crystallized, and as it is found in the juice of the grape (as well as in other fruits) it has received the name of *grape sugar*. It is thus in a large variety of forms that we meet with starch products.

Common *dextrine* is used most extensively as a gum, and is sold under three different forms—(1) as a powder, (2) as a syrup, and (3) as a gum very like gum arabic. In this last form many persons were afraid that it could be used as an adulteration of gum arabic, but there is no fear of that, for potato gum has a peculiar smell and taste (of potato oil) which will at once betray its presence.

Dextrine in its first or powdery form is used greatly by the manufacturers of cheap silk and cotton goods. In consequence of the rage for *cheap* articles, the manufacturers must replace a portion of the silk or cotton fabric by a cheaper substance—hence they weave their goods very loose and then pass them through a solution of dextrine. This swells out the stuff, and so long as it is unwashed it does very well; but the least wetting will of course reveal the true state of the case. To such an excess has this plan been extended that the manufacturer makes enormous profits. "With farina at 2d. or 3d. a lb., it must be very profitable to sell yards of starch at even a much lower price than the lowest cotton goods could be supplied," as Mr. Simmonds remarks. In fact, in 1859, one Manchester house used no less than 6,000 cwts. of starch for this purpose, and the manufacturer may almost be said sometimes to make his cloth a vehicle for potato starch. Another use to which this dextrine is put is that of gumming adhesive labels and postage stamps.

The story of the discovery of this dextrine is worth recording. A workman who had been present at the burning of a large starch manufactory, and had been assisting in bringing water to put out the fire, discovered on getting up the next morning that all his clothes were perfectly gummed together. Some of his comrades who had also been at the fire, experienced the same inconvenience, and they therefore visited the scene of their previous night's exertions. They found the starch converted into large masses of gum, and on going home they instituted a series of experiments, and obtained a very fair sample of gum, though not sufficiently pure for the calico manufacturers. They sold their secret at last, but it was some years before the gum came into general use. A very interesting account of its history is given in "Household Words," vol. 5, under the title of the "*British Gum Secret*," but is too long to insert here.

The gummy form of dextrine is made by boiling it in the state of syrup, and keeping it at a temperature of 40° or 50° for 24 hours. It will then acquire the consistency of jujube paste. After this it is cut up with a pair of shears, and rolled out on a smooth table, and left for three or four hours to dry. It is packed more readily than when in the powdery form, and from its not fermenting is preferable to liquid gum.

Grape sugar is also called glucose, and being very easily and cheaply made, it was at one time extensively used for adulterating cane sugar. The excise authorities, on becoming aware of this, imposed a duty on it, since which time it has ceased to be prepared. As an instance of the great profit derived from the manufacture of grape sugar, 1 cwt. of starch produces 140 lbs. of sugar.

Glucose can also be obtained in the form of a treacle. A few years ago golden syrup was much in vogue—it is believed to be nothing but this glucose. In this form of syrup it is largely used by the French confectioners, and from having a large quantity of viscous matter in its composition, it is eminently suited for making beer, and is largely used for this purpose in Germany. Ship beer is also brewed from this starch sugar, and is proof against climate.

In connection with the "spirituous" portion of the subject, may be mentioned the fact that as potatoes are very readily fermentable, they are used in distillation. The Scotch distillers use them freely, but to nothing like the extent to which the manufacture is carried on on the continent. In Prussia 7,000,000 bushels are used annually for the purpose of brandy-distilling. Stettin brandy, well known in commerce, is largely imported into England and re-shipped to Australia and other foreign possessions as Cognac, and is placed on many tables in England as the same; while many people perfume themselves with the spirit of the potato, under the designation of Eau de Cologne, in the cheap imitations of that perfume which are sold. The exceedingly strong, colourless spirit used for doctoring sherries when imported into England, is merely the potato spirit, highly refined.

In Poland there is a most extensive manufacture of potato-whiskey, called there Wodka. It is a most detestable compound, but being very cheap (7½d. to 10d. a gallon), it has an enormous sale, the consumption being about seven gallons per head. 2,500,000 gallons were made in Saxony in 1851, and in Norway, between 1st October, 1855, and April 30, 1856, over 2,000,000 gallons were made.

When potato brandy is made, there comes with it a very peculiar spirit called *fusile oil*, or *potato spirit*. It can be separated from the brandy, to which it gives a very unpleasant taste. From this fusile oil many artificial essences, &c., are made. The essence of Jargonelle pears is made from it.

Two other extraordinary products of potato may be mentioned—

(1). *Coffee*. A French chymist has asserted that by mixing a certain portion of olive oil and potato flour together, and then adding a small quantity of coffee-powder, a very near resemblance to coffee can be obtained; and

(2). *Cheese*, made in Thuringia and Saxony. The large potatoes are boiled, peeled, and reduced to a pulp. To 5 lb. of this pulp add 1 lb. of sour milk, and some salt; knead together, and after four days repeat the process, and then leave it to dry in baskets. In about 20 days altogether the cheeses are fit to eat, but improve by age. They do not engender worms, and will keep good for a number of years if stored in a dry place and in well-closed barrels. They are made of various qualities.

Such are a few of the products of the potato. But a few *bye* products may be mentioned. The water from which the starch is deposited is well suited for irrigation. It holds the nitrogenous part in solution, and if kept a short time produces an evolution of sulphuretted hydrogen gas. This water is also useful as a scourer for cleaning silks and woollens. It is also used as a cure for chilblains. The pulp after extracting the starch is useful for pigs' food, though this is denied by Professor Henslow. Whatever view be taken of this point, however, it is undeniable that the versatile and wonderful potato can be converted into picture frames, paper, and many other articles usually made of paper.

There were thirty-nine present.

MEETING HELD MARCH 29th, 1866.

Ornithology.

A. C. **Almack** read a short list of the eggs obtained during the past fortnight, and exhibited those of the Wood-wren, Butcher-bird, Woodchat, Red-backed Shrike.

A. **Herklots** exhibited a remarkably small specimen of a Rook's Egg.

Archæology.

F. C. **Lightfoot** gave a short summary of the proceedings of this Section since the last Meeting.

Rev. T. A. Preston exhibited a Half-Groat, found near Cirencester.

Entomology.

W. W. Dayman mentioned the notices of Lepidoptera that had been brought to him during the half-year. Among them were four species new to the College List.

The Rev. T. A. Preston exhibited a large box of Brazilian Insects, among them specimens of the "Emperor Moth," 14 inches across the wings, the "stick insect," some magnificent specimens of butterflies, a great variety of very remarkable leaf insects, and several Coleoptera.

Botany.

Rev. T. A. Preston passed round a list of the notices of plants as yet obtained. He also exhibited dried specimens of Arnotto, Allspice, Tea, Arrowroot, Cinnamon, and Vegetable Ivory.

A. Marshall exhibited a Paper-knife of Sandal-wood, with a dried specimen from the tree.

H. A. Evans then read a paper on "The Classification of Insects."

There were forty-four present.

MEETING HELD APRIL 13th.

This Meeting was held in the Modern School.

The following donations were announced, and thanks ordered to be given to the donors :—

"Recreative Science," "Popular Science Review," and "Intellectual Observer," complete, by Rev. J. M. Fuller, who kindly undertakes to continue the same, and to bind up the parts yearly.

A donation of £5 by the Right Hon. T. H. S. Sotheron Estcourt.

An annual subscription of £1 by Christopher Hodgson, Esq.

Entomology.

W. W. Dayman gave a short report of the Entomological notices during the past fortnight.

G. K. Mills exhibited a specimen of the Tussock (*D. pudibunda*).

Ornithology.

In the absence of A. C. Almack no report was made.

Botany.

Rev. T. A. Preston read out a list of the principal notices taken during the previous fortnight, and mentioned the discovery of two species of

Stonecross (*Sedum*) by G. F. Ruck and H. A. Evans. He also exhibited the pericarp of the Brazil-nut, specimen of the gulf-weed (*Sargassum bacciferum*), a specimen of the Jew's-ear Fungus (*Auricula Hirneola Judæ*) found at Preshute, and specimens of Cumshaw Ball Tea, Cumshaw Present Tea, made up in the shape of faggots or cigars, and Burmese Brick Tea.

Archæology.

F. C. Lightfoot gave a short account of the proceedings of the Section, and exhibited a small Roman lamp.

Rev. T. A. Preston exhibited specimens of pavement, &c., from Wroxeter, near Shrewsbury.

Geology.

Report deferred till next meeting.

The Rev. J. F. Bright gave a lecture on "The General Classification of the Animal Kingdom."

There were about 40 persons present, among whom were the Master and several Members of the Common Room.

MEETING HELD MAY 4, 1866.

The following donations were announced, and thanks ordered to be given to the donors:—

A pocket microscope, by R. G. Clarke, Esq.
A donation of one guinea, by Mrs. Norris, Epsom.
An annual subscription of £1, by R. Hunter, Esq.
The "Geologist," by Rev. T. Cornthwaite.

Geology.

C. A. Harrison gave a report of the working of the Section, and exhibited a drawer of various specimens, among which were a horse-shoe, which had become oxidised, and converted the mould in which it was embedded into a substance resembling iron ore. A huge specimen of Scaphite, from the Isle of Wight, to show what may probably be found here; and the following fossils found in the neighbourhood: Fragment of large *Inoceramus*, by W. J. Greenwell; *Plagiostoma Spinosum*, and Shark's Tooth.

Entomology.

A. Marshall gave a list of the notices of captures during the past fortnight. He then showed a Humming-Bird Hawk Moth (*M. Stellatasium*), captured by R. W. Wickham, on April 25.

The President exhibited a specimen of Bombex Cynthia, the new Silkworm Moth recently introduced into England; the New American Moth-trap; specimens of Stuffed Larvæ of Swallow-tailed Butterfly (*P. Machaon*); Oak-eggs (*L. Quercus*); Drinker (*O. Potatoria*); Gooseberry Moth (*A. Grossulariata*); Vapourer (*O. Antiqua*); Gold-tail (*P. Auriflua*); Dagger (*A. Psi*), etc.

Ornithology.

A. C. Almack read out a list of the notices, comparing them with last year, and exhibited specimens of the following eggs: Daulin, Chough, Roseate Tem, Leoses Tem, Spoon-bill from his own collection; nest and three eggs of Ring-Oazel, taken near Savernake House, May 2, by E. H. Parr and J. W. Parrington, egg of the Stone-chat, and monstrosities of the following: Yellow-Hammer, House-Sparrow, Rook, Blackbird, Cochin-China, and Common Hen, all taken this year in the neighbourhood.

The President exhibited a living specimen of the Night Jar, taken near Polton.

A. Marshall exhibited a leg of the Emu.

Botany.

The President passed round a list of the notices for the month of April, comparing them with last year, and exhibited a specimen of the Hautboy Strawberry (*F. elatior*), found by R. R. P. Hilton, and hitherto unrecorded.

Zoology.

The President exhibited a Viper and a Common Snake.

E. Almack exhibited a specimen of the Thorny Oyster, and Palate Teeth of the Port Jackson Shark.

R. B. Mainwaring exhibited a large Shark's Tooth, and piece of Palate of Shark's Mouth.

R. F. Isaacson was elected to fill the vacancy in the Committee caused by H. A. Evans' departure.

Archæology.

F. O. Lightfoot read the following paper, by H. M. Moule, Esq., on

BARBURY CASTLE.

The neighbourhood of Marlborough teems with the relics and vestiges of early British civilization—a civilization now not only *past* but *dead;* past, that is to say, without having left behind it any appreciable results which live and fructify among ourselves. For all, or very nearly all, that we now are in the scale of nations, we owe—not to our aboriginal ancestors—but to the successive invaders of our shores. Still, with Saxon and Norman influences predominating in our blood, and with Greek and Roman influences ruling in our national brain, we cannot help, notwithstanding, every now and then throwing a wistful glance backwards into that remote and dark antiquity which we understand so imperfectly, but from which we cannot wholly disconnect ourselves. The charm and interest of archæology is certainly most various. Salisbury Cathedral speaks home to our hearts in tones of nearly perfect harmony; Stonehenge enchains our sympathy with, perhaps, scarcely inferior power, though uttering in comparison a strange and scarcely articulate appeal. It is just so, in their proper degree and proportion, with the earthworks, small and great, which stud the

> broad backs of our bushless downs.

There they lie, without a voice and almost without a history. Literature throws only a rare and scanty ray here and there upon them: some few passages in Cæsar, some disputed notices in the Saxon Chronicle, make up the bulk of our written information respecting them. Few minds, however, that are not either inactive or narrow, will fail to discover a charm even in this very obscurity; and the earthworks will probably continue to present riddles and problems which, whether solved or not, will interest and instruct us.

One of the finest relics of British work near Marlborough is Barbury Castle, which stands on the end of a magnificent reach of downs, about six miles north-west of the town. It occupies an intermediate position between the fort on Martinsell and Liddington Castle, which lies about four miles further away to the north. Barbury commands a splendid range of view; it is perhaps hardly too much to say that an experienced commander from that lofty post might have detected any hostile movement whatever that was on foot within a radius of ten miles, and in some directions to a greater distance still.

This earthwork of Barbury is oval in form, and is surrounded by a very regular double rampart, with an imposing trench between the banks. The dimensions are these, according to Sir R. C. Hoare:—

Entire circuit of outer rampart	880 yards (½ mile)
Depth of trench	47 feet
Area within trench	12½ acres

The old fort lies about east and west; and the eastern extremity is protected by a barbican or outwork, the mounds of which are most distinctly traceable.

Barbury was undoubtedly used as a *rendezvous* and fastness during the Saxon period. The British earthworks were very generally converted by the

Saxon settlers to their own purposes. In some remains, it is easy to detect alterations of design, enlargement in certain directions, curtailing in others. The true mark of the *Roman* soldier is, of course, the parallelogram figure, in which his camp was invariably drawn out, as distinguished from the irregular oval of the British designer. Putting aside, however, the marks of Saxon interference at Barbury, enough remains to convince the antiquarian that it was a *bona fide* Celtic work, forming, probably, one of a large chain of forts, of which Martin's Hill and Liddington were the two nearest links.

As a means of illustrating the extent and probable uses of these great hill-forts, let me briefly mention a few points relating to *Maiden Castle* (or the Castle of the "Great Hill" [Brit. *Mai, Dun*]), which is a work lying about two miles to the south-west of Dorchester, the county town of Dorset. This work, the completest fort of first-rate dimensions in Great Britain, is raised on a gentle slope of down, the scarping of which has been on the north side improved and made use of as the outer rampart. The entire area within the innermost rampart is *forty* acres, or rather more than three times the size of Barbury. There are three ramparts, with two trenches, and the outermost of these trenches measures not less than *seventy* feet deep. At two points in the circumference the entrances to the interior area are contrived so as to be very fully protected by overlapping the ends of the ramparts, and the design in this respect (so far as it goes) is as elaborate as anything in modern engineering science. This great work is, however, quite destitute of water supply. There are, it is true, one or two points in the area at which it is conjectured that wells may have been sunk, but these traces are extremely vague and uncertain.

Partly from this want of water, and partly from a general survey of this and similar works, it is conjectured with great probability that the use of hill-forts was as follows:—In time of war, the chief of a tribe would collect together all his fighting-men, and that would signify, generally speaking, the bulk of the able-bodied adults belonging to the tribe. Great numbers of these would have to leave homes unprotected, and cattle or sheep running loose, unless some temporary provision were made for both. That provision was supplied by the hill-forts, just as is now the case with the "pahs," or temporary enclosures employed by the New Zealanders. Inside a hill fort like Maiden Castle, the women and children and the cattle of a very numerous tribe, might well be encamped for a limited time. During that time they would be provisioned partly by supplies taken in with them, partly by the exertions of the fighting-men outside. In this way also, or at any rate by the additional aid of small temporary wells, they could for a short time be supplied with water. Had the hill-forts been meant to act as permanent towns, doubtless far more extensive traces of water-works would be now visible. The immediate danger over, the defenceless inmates of the fort could gradually make their exit, returning to their homes in case of victory, or seeking fresh ones in case of defeat.

Such was the probable purpose of Barbury Castle in the minds of its original designers. The Saxons turned the forts into war-centres or places of meeting for the reeve-men and yeomen of the divisions called "Hundreds," which divisions still frequently appear in legal documents, though they have no legal force—the county, the parish, the union, the district, being the only territorial divisions in our day.

Excavation has done but little for the earthworks of Wessex. Coarse pottery, with here and there an iron implement of very uncertain date, comprises nearly all that generally rewards the search of the archæologist. We must probably content ourselves with the knowledge which we possess at present. It is enough to shew us that our remote British ancestors were possessed of no mean degree of civilization; that they could construct works of gigantic and sometimes of complex design, and that they led lives of stirring enterprise and activity. But the want of a literature—the absence of a *vates sacer*—keeps us blind to the details which we should rejoice to recover.

While surveying the magnificent panorama of down-country visible from Barbury, or examining the quaint old banks themselves, perhaps the prevailing thought is one of regret that great remains like Silbury and Avebury, no less than these smaller ones, are for ever dumb: that we know more even of the siege of Troy than we do of the great battle of Badon, which once made Britain quake from end to end; that Stonehenge is little more to us than a splendid riddle, and *King Arthur* only the central figure in a grand but dim poetical group.

There were forty-eight persons present.

MEETING HELD MAY 11TH, 1866.

Geology.

C. A. **Harrison** exhibited the following specimens:—A small shark's tooth found in the preceding week near Martinsell; some fish scales; *Pecten nitidus.* He also announced that more sharks' teeth had been found in the same locality.

Entomology.

A. **Marshall** read a short list of notices.

Ornithology.

A. C. ALMACK exhibited the following eggs:—A spotted and unspotted Jackdaw's from the same nest, Little Bittern, Baillon's Crake, Avocet, Marsh Harrier, and Spotted Crake.

Botany.

The PRESIDENT read a list of notices, and compared them with those of last year. He also exhibited the following:—Mousetail (*Myosurus*), from Brimslade; a young Furze-bush; *Statice* from Teneriffe; Morells.

The paper was J. Pole's, on "Mosses," which was read by the President, owing to the author having left the College.

There were forty-one persons present.

MEETING HELD MAY 25, 1866.

Entomology.

A. MARSHALL read out a list of captures during the last fortnight, mentioning particularly the capture of *E. Anguinalis*, for the first time.

C. E. POWELL exhibited specimens of *M. Artemis*, *E. Anguinalis*, *P. Ænea*, &c., taken during the present year.

Botany.

The PRESIDENT mentioned the discovery of *Cineraria Campestris* and *Montia Fontana*, hitherto unobserved here, and the discovery of *Myosurus Minimus* at Pewsey.

J. J. PULLEINE, ESQ. exhibited specimens of primroses, shewing the varieties leading to the so-called Oxlip, a species which only occurs in the eastern counties of England.

Geology.

C. A. HARRISON exhibited specimens of wood in chalk, *Pleurotomaria* (not *in situ*) in chalk; Scaphite from Martinsell; a fossil twice fossilized; Ventriculite in chalk; and iron Pyrites.

T. W. DAVIES exhibited specimens of Ammonite, &c.

Zoology.

H. W. HOCKIN exhibited a young turtle hatched on a homeward voyage from the West Indies.

The President spoke at some length upon "Palms," illustrating his remarks by numerous specimens lent by P. L. Simmonds, Esq., of London, exhibiting some of their uses, among them were sections of wood, "Penang Lawyer," various kinds of Leaves, a bunch of the Fruit of the Oil-Palm, Double Cocoa-nut from the Seychelles, Coquilla Nut, Vegetable Ivory, numerous specimens of the fibres: Cloths, Mats, Hats, Baskets, Cowry-Bags, Hammock, Palm-oil, Brooms, Partridge Cane, Coir Yarn, and Spoon.

There were fifty-one persons present.

MEETING HELD JUNE 8, 1866.

Ornithology.

A. C. ALMACK laid on the table the list of notices for May, and exhibited specimens of Eggs of the Stone-Curlew (taken by Soames), Buzzard (from his own collection), Nest and Eggs of Grasshopper Warbler, Wheatear, and Redpole (?), Egg of Coot, and varieties of those of Sparrow-hawk, Jack-daw, Magpie, Cuckoo, Tree-Pipit, Skylark, House-Sparrow, Willow-wren, Thrush (without spots), Redstart (with spots), Whinchat, monstrosities of those of the Partridge and Moorhen.

E. LLOYD exhibited two eggs of the Woodpecker.

Entomology.

Among the notices of the last month were *P. Alsus*, *M. Artemis*, *P. Bucephalas*, *N. Plantaginis*, *C. Porcellus*, *G. Trilinea*, *N. Lucina*, *S. Populi*, &c. Numerous captures had been made in the Micro-Lepidoptera, but were not ready for exhibition.

E. LLOYD exhibited specimens of the Pupa and perfect insect of the Cicada, from Italy.

G. K. MILLS exhibited a bred specimen of *S. Ligustri.*

Geology.

C. A. HARRISON exhibited specimens of Coral from the Flint. Ostrea, bored by a Teredo, from London clay; *Terebratula*, oxidised, *Pectunculus*, *Ammonites Milletesius*, and *Natica*, from the Coral Rag.

Botany.

The PRESIDENT exhibited a specimen of the *Crepis Biennis*, discovered by R. R. P. Hilton, at Mildenhall. This is the first authentic instance of its discovery in this part of England.

A. C. **Almack** read a paper on the

PLUMAGE OF BIRDS.

Unquestionably the most beautiful as well as the most characteristic part of a bird is its covering of feathers, whether we regard the plumage of the eagle, so firm, so expansive and majestic, or that of the bird of paradise, with its gossamer-like tail, or the lovely humming bird glittering like the most brilliant gems. And surely it is some satisfaction to find that the symmetry and elegance of those feathers, and of the general form of the bird, though so very pleasing to the sight, are much more so when considered with regard to the habits and mode of living of their possessors, to which they are eminently subservient. Every part of their frame is formed for lightness and buoyance, and nothing could be more strikingly formed for this purpose than the light and delicate plumage with which their bodies are covered, so disposed as to protect them from the severest cold of the atmosphere; their wings are made of the lightest materials, and yet they strike the air with such force that the bird is propelled forward with astonishing rapidity.

But what, perhaps, contributes more to the ease with which birds fly than the lightness of feathers is the universal diffusion of air through their bodies. But perhaps I am rather hasty in asserting that such is the object of this diffusion of air, as it has been doubted by Mr. Hunter, owing to the fact that in the ostrich, which never rises from the ground, this conformation is also discovered. But on second thoughts it appeared to Mr. Hunter that this bird would require this diffusion to help it in running as much as others for their flight, by increasing its bulk and strength without adding materially to its weight.

Having now spoken of the general effect and object of feathers, let us examine them more minutely. In considering the clothing of a bird we may divide it into two parts, the down and the feathers proper. These two are in reality composed of the same substance, and so, chemically speaking, are even the beaks and claws, viz., coagulated albumen, which is nearly the same substance as that of which the hair and cuticle of all animals, and even the epidermis which covers living shells, is formed. This coagulated albumen, especially as we see it in the case of white of egg consolidated by heat, is better calculated to resist the action of water than almost any other flexible substance. This substance, especially in the upper or more coloured and glossy part of the feathers, is mixed with oils and metallic substances in very minute portions, which give it the colours the feathers assume; but in the down and light-coloured feathers it is nearly pure. The down lies on the under part of the clothing feathers: and also a small portion of almost all the feathers near the tube or barrel consists of down, which is also spread at intervals over the skin between the feathers. The chief purpose of the down seems to be that of warmth, as we find it increase in proportion as the bird is exposed to a cold temperature, especially in the Eider Duck. And when the bird remains all the year round in the same situation where there are great changes and differences of temperature we find that the down very much increases in thickness during the winter.

The form which the down assumes too, is often characteristic of the habits of the bird. In the ostrich, for instance, there is none, owing, I suppose, to its living in such a warm climate.

And now for the feather proper. Let us speak of a single feather first, and afterwards of their general arrangement over the body. All feathers have certain fixed and special characteristics, which are universally applicable, whatever may be the varieties of size, consistence, and colour. The various parts of a feather are the following:—the barrel or quill, which is the root part of the feather, up to where we find the vane or beard on both sides, when the centre part takes the name of shaft.

The quill, by which the feather is attached to the body, is an admirable specimen of lightness, combined with tenacity and firmness. On close examination we find a very small hole at the lower end, which leads into the cavity of the quill, in which we find a number of membranous pieces of conical shape, fitting closely into another. I need hardly draw the attention of such an assembly as this to remember the immense value that this part of the feather is to man.

The quill, as soon as we reach the beard, we find no longer to be round, but somewhat quadilateral, and, as I said before, is now called the shaft. There is not nearly so much hollow space in it as in the quill, but within a very horny case we find a great quantity of white substance, which is called the pith.

We now come to the *vane*, which is by far the most curious part of the feather, and at the same time the most useful to the bird, though totally useless to us. If we attempt to separate the barbs of a quill pen or any feather we find that they cling somewhat closely together, as if held to one another by hooks. This is exactly the case, for on looking closely with a tolerably good lens we see that the barbs are arranged with their flat faces toward one another, and that along the top of each barb there is a row of hooks sticking out on each side. These hooks are called barbules, and are arranged in such a manner that they interlace, and cannot easily be separated. This arrangement is also in a curious manner self-acting, as the moment after separation that they are brought together again, they interlock, and all is as firm as before.

1.—A feather may consist of a quill and shaft, without any other part.

2.—A quill, shaft, and barbs destitute of barbules, as in the crest of the golden pheasant, and the feathers of the ostrich.

3.—A quill, shaft, barbs, and barbules.

4.—A quill, shaft, barbs, barbules, and barbicels, as in the ring-tailed eagle, albatross, and helmet hornbill.

The feathered race are supplied with a curious oiling apparatus, situated at the base of the tail, which, when spread over the feathers, renders them impervious to moisture.

Having now gone through the anatomy of a feather, let us consider for a moment the admirable way in which they are adapted to the habits and wants of a bird. Of course without this arrangement of hooks and barbs a web could hardly be formed of sufficient closeness of texture to resist the air in the use of the wings in flight.

The lightness of feathers has become proverbial, and no texture or substance of human fabrication can possibly be compared with them. It will hardly be believed that the entire plumage of a common owl frequently does not exceed an ounce-and-a-half in weight, and that the largest feathers of the mighty golden eagle do not exceed 1 drachm 5 grs. in weight, seven of them weighing not quite so much as a five shilling piece. Yet if we attempt to injure or break one of these feathers we shall find it fully as remarkable for its stiffness and tenacity as for its lightness, both of which qualifications are remarkably necessary for an apparatus formed for flight. Feathers, however, in point of compactness, differ greatly in different birds and in different parts of the same bird, of which we have a striking instance in the case of the tail of a peacock and its own wing, or that of any other bird; and I think that in general we shall find that the wing feathers fit much more compactly than those in the tail of almost all birds.

We now come to the names of the different feathers, and their arrangement on the body of a bird. The names of the feathers and their position are the following:—

1.—The *ear-covert*, which consists of certain soft feathers which cover the external organ of hearing. They vary much, and are used as a means of distinguishing many species. They are also known as the auriculars.

2.—The *scapulars*, which are the feathers which cover the part that answers to our shoulders, and the part above the elbows. They unite in colour to a great extent with the feathers on the back. They are of no use in flight, but as they are tolerably thick they afford a good covering for the wing joint, and are so arranged that they admit of easy motion in the wing.

3.—The next we come to are the feathers that go by the name of the *bastard wing*, so called from their resemblance to the feathers of the true wing. They grow from a small bone, which is united to the third joint of the wing, which answers to our wrist. This bone and these feathers are curiously increased in strength in proportion to the power of the bird's flight, The jer-falcon is given in books as the most signal instance of this, in which bird the development of this part, which corresponds to our hand, bears a most wonderful resemblance to it. In this bird the thumb consists of distinct bones, jointed together, and the four other fingers may be traced, the first in a long bone, the second in a shorter one, and the fourth in two ribs united by a thin blade. What use the bastard wing is put to we cannot well determine, but probably it prevents the wing from turning upwards.

4.—The *lesser wing-coverts* are the first feathers that appear on birds. There are generally several rows of them lying along the wing, and under-coverts answering to them underneath, which are more downy and colourless.

5.—The *greater wing-coverts*, which lie underneath the former, and reach a good way over the real wing feathers, and act as supports to them.

6.—We now come to the real wing feathers, which are the organs of flight. They are the strongest feathers on the whole bird. They rise from the third bone in the wing, which answers to our hand taken as a whole. There is a great deal of variation in the flight of birds owing to the different proportion these feathers have to one another. The first is not always largest. The form of wing with which a bird can turn with the greatest ease in the air is the second feather longer than the first, so that the first comes partially under it and supports it. This is the construction of wing we find in the case of all birds that take their food, as swallows, or their prey as hawks, on the wing. In pigeons also we find it the same, and in the lapwing the largest feather is farther in still.

There were forty persons present.

MEETING HELD JUNE 23, 1866.

Geology.

C. A. Harrison read the following report of the Geological Section during the half-year:—

You will, I am afraid, think our report somewhat meagre—and indeed, it could scarcely be otherwise. It would be easy to read you a list of the fossils found—in all more than 50—but this might perhaps be tedious, and would certainly be useless. When the Natural History Society proposed the formation of a Geological Section, it did not, we presume, intend to encourage merely a collecting mania. The mere collecting, whether of fossils, moths, or postage-stamps, may be a useful form of industry, exercise, or observation, but on no plea can it be considered a branch of science. What we believed the Society to desire was that we should try to shew wherein the value of fossils consists, by bringing their evidence to bear on the physical geology of the district, and on the changes which have taken place or are now taking place in the surface of the country about us.

But we have been at work too short a time—not three months—for success in this. Our facts, that is, our fossils, are too few for generalisations from them to be more than guesses, and occasionally, indeed, our uncertainty about the very nature of the fossils would render such guesses most rash and unscientific. One fact, however, seems tolerably clear. You remember that there are in England four lines of chalk hills. One rising in Dorsetshire, and extending, under the various names of Dorset Downs, Marlborough Downs, and Chiltern Hills, as far as the north-west point of Norfolk, and then, after being broken by the Wash, across Lincolnshire and part of Yorkshire to Flamborough Head. A second branches off from the Marlborough Downs, and with a slight break near Farnham, extends to Dover, under the name of North Downs. A third stretches from Dorsetshire, south of Salisbury, thence to Beachy Head, forming the South Downs, while a fourth, springing also from the Dorset centre, forms the Purbeck Downs, is broken by the sea, and again reappears as the central ridge of the Isle of Wight.

Apparently, then, we lie near the extreme west of the great chalk bed of England; and the first question we asked ourselves, as mere beginners, was whether the Marlborough Downs were really near land, whether continent or island, or were far out at the bottom of the cretaceous ocean in which the chalk was deposited. Now if they had been near the land it is quite clear that there must have been washed down to the floor of the ocean the ordinary materials of a sea-beach, and our chalk must have contained at all events sand, perhaps even water-worn pebbles. So far, however, is this from being the case, that the chalk even of the highest beds is singularly pure, and can be used equally well by the mathematician and the fives player for their respective boards. The fossils, too, are all unmistakeably marine—sharks' and fish teeth, scales of fish, chambered shells—such as the Ammonite—sea urchins, corals and sponges. And yet although so obviously at some distance from the shore, there must have been setting in this direction either a land current, or the course of a river before its waters were quite lost in the ocean, for in Rockley Quarry organic remains have been found, certainly not native to the sea-bottom, and which must have drifted from the land, viz., fossil wood and fossil bone, the latter apparently the bone of some *saurian*, decidedly not of a fish. In the same quarry, too, much of the chalk is covered with small black specks, traces of the mineral chlorite, also in all probability brought from land by some current.

Next half-year we hope to make out exactly which are the lower, which the upper, chalk beds in this neighbourhood, and work at other questions of the highest interest.

In conclusion, I must in the name of the section sincerely thank Mr. Mullins for the great interest he has taken in our proceedings, and without whom, I am sure, geology here would not have made much progress.

Botany.

The PRESIDENT mentioned a few of the more important notices obtained since the last meeting, and exhibited a specimen of the Bee Orchis (*O. Apifera*), found near Martinsell by A. Armstrong, Esq.

H. A. EVANS exhibited a remarkable species of *Aristolochia*, from the Oxford Botanical Gardens.

Entomology.

C. A. HILTON exhibited a remarkably small specimen of the Common Blue Butterfly (*P. Alexis*).

The PRESIDENT passed round a box of Moths, forming part of a donation from J. W. Dunning, Esq., to the College Collection. Among them were specimens of *S. Convolvuli, C. Elpenor, P. Interrogationis, P. Orichalcea, P. Festucæ, Bankia Bankiana, &c.*

Ornithology.

J. W. PARRINGTON exhibited a nest and eggs of the Tree Creeper.

A. C. ALMACK exhibited varieties of eggs of Jay and Common Wren.

The SECRETARY then gave a short summary of the proceedings of the Society during the past half-year:—

Total number of Exhibitions, including 12 collections...	154
Ditto last half	116
Average ditto per meeting..................................	15·4
Ditto last half	14·4
Average number of persons present at the meetings ...	44
Ditto of visitors	25

A vote of thanks to F. C. LIGHTFOOT on his leaving the College was carried unanimously.

The PRESIDENT then congratulated the Society on its improved condition, and called attention to the fact that a new meeting-room was being fitted up for it by the College, and would probably be ready by the beginning of the next half-year. He also gave notice that there would be no tea after the meetings, and the money which had hitherto been devoted to that purpose would be spent in the purchase of Books for the new Library, which the Society must have, and of which the Books received this half-year would form a very good nucleus.

There were forty present.

BOTANICAL NOTICES.

CONSIDERING the small number of those who take any interest in the subject of Botany in the School, the amount of work done must be acknowledged to be very satisfactory. The number of notices is certainly not less than what it was last year, and this is more particularly remarkable, as the weather, as a whole, has been remarkably unsuited for Botanical work. It is hoped we shall soon be able to classify the different plants according to districts, and thus to see clearly how far we resemble and how far we differ from other localities of a similar geological formation. It has been remarkable how many chalk plants which *ought* to have been found here, have not yet been detected, and it was this fact more especially which has hitherto prevented our giving any table shewing these desiderata, because our materials are not even yet sufficiently complete. Absence from Marlborough during July and August is a great drawback, and this can only be remedied by the co-operation of residents in the neighbourhood, which at present we have not been able to secure.

The number of plants which we *might* have observed, but did not, is very small, and as a general rule satisfactory reasons can be given to account for the omissions. In most cases the plants appear not to have been in flower before the holidays, and therefore the scanty notices which have been recorded are not available for general results. On the other hand many additional localities for plants already recorded have been discovered, and at least twenty new species added to our list. It may be interesting to others as well as to Botanists to compare the "Floral Calendar" of this year with that of last.

The remarkably mild winter caused plants to sprout very early. At Christmas the gooseberry bushes were very forward, and early in February many trees and shrubs were budding rapidly: most of the early spring flowers, also, were above ground, and vegetation was, therefore, far in advance of what it is in ordinary years. About the middle of February a colder period set in, checking this unusual forwardness, and thereby doing a considerable amount of good. During the latter part of February and the whole of March the temperature was below the average, and but little progress was made in vegetation; but as the trees and shrubs were not too far advanced, no harm was done. With April came a slightly warmer period, and plants began to make a fresh start, and though the weather was very variable, still considerable progress was made.

But the month of May was particularly unfavourable to vegetation. It opened with very cold weather, and as soon as the temperature became warm enough for the leaves to expand, a very dry period set in, accompanied with strong easterly winds, so that in exposed situations the young leaves were torn to shreds, and the plants were unable to make much progress. The lilac was also greatly damaged, the wind and frosts killing many of the buds in the bunches, and thereby causing the trees, though in as full bloom as ever they would be, to present the blotched appearance which they assume when the flowers are passing off. Another very noticeable feature is the long time that elapsed between the first appearance of leaf buds and the time when the tree might be said to be in full leaf, affording in this particular a marked contrast to what occurred last year: from this circumstance, also, *locality* made a great difference in the time when plants were in perfection, some trees being even weeks in advance of others of the same species, merely from being less exposed. The district in the immediate neighbourhood of Marlborough, however, appears to be far more backward than those a few miles off.

The month of June was very favourable though the country was not really green till after the first week had passed. Since then plants have come rapidly into flower, but vegetation is rather backward when compared with other years.

Unless mentioned to the contrary, the dates given are those of the times of first flowering, "By" is added when the plant appeared to have been in flower a few days. An asterisk (*) indicates that the specimen observed was a cultivated one.

Names in Capital Letters indicate that the plants have not hitherto been recorded as occurring near Marlborough; those in italics, that they have been observed in new localities.

Names of those whose initials are given in the following list:—

M. O. A....................	M. O. Alison.
A. C. A.	A. C. Almack.
A. A.	A. Armstrong, Esq.
H. R. A.......	H. R. Armstrong.
F. F. B....................	F. F. Back
C. M. B.	C. M. Bevan.
H. C. B................ ..	H. C. Blaker.
W. E. B.	W. E. Bolland.

J. H. C.	J. H. Calley.
L. C. C.	L. C. Calley.
W. R. C.	W. R. Carles.
E. H. C.	E. H. Carr.
C. J. C.	C. J. Cole.
E. H. D.	E. H. Davis.
W. W. D.	W. W. Dayman.
H. A. E.	H. A. Evans.
R. B. F.	R. B. Forrester.
E. F.	E. Freeman.
C. E. G.	C. E. Green.
C. A. H.	C. A. Harrison.
A. H.	A. Herklots.
G. A. H.	G. A. Hight.
J. E. H.	J. E. Hilliard.
H. M. H.	H. M. Hilton.
R. R. P. H.	R. R. P. Hilton.
A. P. H.	A. P. Hockin.
H. W. H.	H. W. Hockin.
G. H.	G. Holden.
A. G. H.	A. G. Hunter.
R. F. I.	R. F. Isaacson.
F. J. H. J.	F. J. H. Jenkinson.
J. H. J.	J. H. Johnson.
E. A. K.	E. A. King.
T. L.	T. Lister.
E. L.	E. Lloyd.
H. W L.	H. W. Lyall.
T. E. M.	T. E. Maclean.
R. B. M.	R. B. Mainwaring.
A. M.	A. Marshall.
H. A. M.	H. A. Marsh.
J. M.	J. Martley.
W. G. N.	W. G. North.
J. C. P.	J. C. Palmer.
J. W. P.	J. W. Parrington.
H. R. P.	H. R. Parrington.
J. P.	J. Pole.
T. A. P.	Rev. T. A. Preston.
J. J. P.	J. J. Pulleine, Esq.
A. H. B. R.	A. H. B. Reynardson.

S. A. R.	S. A. Rogers.
G. F. R.	G. F. Ruck.
H. S. S.	H. S. Sankey.
F. J. H. S.	F. J. H. Somerset.
H. T. S.	H. T. Stainton, Esq., Mountsfield, Lewisham.
E. F. S.	E. F. Stearns.
P. T.	P. Thursby.

JANUARY AND FEBRUARY.

The remarkably mild winter caused the plants to sprout very early. At Christmas the gooseberry bushes were very forward, and early in February many trees and shrubs were budding rapidly; most of the early spring flowers also were above ground at that time.

Ranunculus Ficaria	Celandine, Feb. 10.
* Eranthys hyemalis	Aconite, nearly over Feb. 10.
* Cheiranthus Cheiri	Wall-flower, Feb. 10, not generally out till April.
Cardamine hirsuta	Hairy Bitter Cress, flower and seed, Feb. 10, *A.M.*
Brassica Rapa	Turnip, Feb. 17, *H.W.H.* (not general).
Sinapis arvensis	Charlock, last year's plants in bud, Feb. 21, *F.F.B.*
Viola Odorata	Sweet Violet (wild) Feb. 28, *E.L.* (cultivated) Feb. 23, *F. F. B.*
Stellaria media	Chickweed, Feb. 18, *J.P.*
Ulex Europæus	Furze, in flower Feb. 25, *T.E.M.*
* Prunus Lauro-cerasus	Laurel, flower-buds far advanced Feb. 20.
Potentilla fragariastrum	Barren Strawberry, Feb. 17, *P.T.*, not generally in flower till about three weeks later.
* Pyrus Japonica	Feb. 10.
* Ribes Grossularia	Gooseberry, fully formed leaves Feb 26.
* R. Sanguinea	Scarlet Ribes, leaf buds bursting Feb. 21, *F.F.B.*
Pimpinella Saxifraga	Small Burnet Saxifrage, bud Feb. 21, *T.E.M.* and *P.T.*
Sambucus nigra	Elder, buds well formed Feb. 24, *F.F.B.*
* Viburnum Laurustinus	Laurustinus, just in flower Feb. 10.
Lonicera Periclymenum	Honeysuckle, leaves, Feb. 16, *F. J. H. S.*

Tussilago Farfara ...	Coltsfoot, Feb. 23, *T. E. M.* and *P. T.*
Bellis perennis	Daisy, Feb. 18, *J P.*
Senecio vulgaris... ...	Groundsel, in flower all the year.
Leontodon Taraxacum ...	Dandelion, Feb. 17, *T. E. M.*
Veronica agrestis ...	Field Speedwell, flower and seed, Feb. 17, *T. E. M.*
V. Buxbaumii	Buxbaum's Speedwell, February 21, *P. T.* and *T. E. M.*
V. Hederifolia	Ivy-leaved Speedwell, February 20, *F. F. B.*
Lamium Purpureum ...	Red Dead-nettle, in flower all the year.
L. album	White Dead-nettle, February 26 (from last year's branches) *R. R. P. H.*
Mercurialis Perennis ...	Dog's Mercury, barren flowers Feb. 18, *J. P.* fertile „ Feb. 26, *J C. P.* not in full bloom till end of March.
Salix Caprea	Great Sallow, catkins bursting February 17, *P. T.*; stamens appearing February 26, *J. M.*; not out by March 1.
Corylus Avellana ...	Hazel, fertile flower, February 21, *M. O. A.*
Taxus baccata	Yew, barren flower, February 21.
* Narcissus Pseudo-narcissus	Daffodil, one specimen in a very warm garden in flower by February 8. No further specimen observed before the end of February. Garden specimens in full bud by March 1.
Crocus sp.	Full flower Feb. 10; in perfection as late as March 17.
Galanthus nivalis ...	Snowdop, in flower during January and February.
* Scilla Bifolia	Twin-leaved Squill, February 10; lasted till nearly the end of March.
* S. Sibirica	Siberian Squill, February 10, lasted till nearly the end of March.

MARCH.

Anemone nemorosa ...	Wood Anemone, March 18, *A. M.*
Ranunculus heterophyllus	Water Crowfoot, full flower March 25, at Lockeridge, *W. G. N.*; not observed near Marlborough till April 18.
R. repens...	Creeping Crowfoot, March 17, *M. O. A.* (not generally out till May.)

Caltha palustris	Marsh Marigold, March 21, *P. T.* and *L. C. C.*
Helleborus fœtidus ..	Stinking Hellebore, by March 24, *E. H. D.*
* Berberis fascicularis ...	March 18, *R. R. P. H.*
* Corydalis solida	Solid-rooted Corydal, March 29.
Draba verna	Whitlow-grass, flower and seed, March 10, *P. T.*, not general till about a week later.
* D. aizoides	Just in flower March 17.
Viola hirta	Hairy Violet, March 23, *A. M.*
Prunus communis	
(*Var. a*) spinosa ...	Sloe, fully formed leaves March 6, *A. P. H.*
(*Var. b*) insititia ...	Bullace, flower March 28, *A. H.* and *E. F.*; flower and leaf March 30, *R.R.P.H.*
Alchemilla arvensis ...	Parsley Piert, March 17, *M. O. A.*
	Peach, in warm garden, March 21.
	Apricot, ditto March 31.
* Ribes Grossularia ...	Gooseberry, some in full leaf March 17, *R. R. P. H.*
* R. Sanguinea	Scarlet Ribes, young leaves, March 21, *R.R.P.H.*
Adoxa Moschatellina ...	Moschatel, March 30, *W.G.N.*
Sambucus nigra	Elder, fully formed leaves March 11, *J. H. C.* and *L. C. C.*
Petasites vulgaris ...	Butter-bur, March 9, *J. W. P.*
* Syringa vulgaris... ...	Lilac, leaf-buds open March 21, *W. W. D.*
Vinca minor	Lesser Periwinkle, by March 3, *W.E.B.*
Lathræa Squamaria ...	Toothwort, March 30, *L. C. C.*
Veronica polita	Grey Field Speedwell, March 30, *R. B. M.*
Nepeta Glechoma ...	Ground Ivy, March 24, *P. T.*
Buxus sempervirens ...	Box, March 25, *J. J. P.*
Urtica urens	Small Nettle, March 10.
Ulmus montana	Wych Elm, March 3, lasted all the month.
Salix Caprea	Great Sallow, fertile catkins, May 11, *A.H.B.R.*
Narcissus Pseudo-narcissus	Daffodil, specimen seen as early as March 6, by *R. R. P. H.*; in flower March 11, *H. W. L.*
Arum maculatum ...	Cuckoo-pint, young spathes, March 4, *J. W. P.*
Poa Annua	Annual Meadow-Grass, March 3, *P. T.*; very few flowers out in March.

APRIL.

* Anemone Apennina	Blue Anemone, April 1.
Ranunculus heterophyllus	Water Crowfoot, April 18, near Marlborough, *A. H. B. R.;* March 26, at Lockeridge.
R. Peltatus	In full flower by May 1, *A. P. H.*
R. Drouettii	In full flower by April 24, *R. R. P. H.*
R. Auricomus	Goldilocks, April 16, *P. T.*
R. Bulbosus	Buttercups, April 17, *G. F. R.*, not generally in flower till April 25.
Helleborus Viridis	Green Hellebore, full flowered, Ogbourn copse, April 18, *A. H. B. R.*
Fumaria Officinalis	Fumitory, April 26, *R.R.P.*
* Dielytra Spectabilis	Bleeding Heart, April 26.
* Cheiranthus Cheiri	Wallflower, about April 10.
Arabis hirsuta	Hairy Rock Cress, April 12, *R. R. P. H.*
Cardamine pratensis	Cuckoo-flower, April 22, *W. R. C.*
Sisymbrium Thalianum	Thale Cress, April 12, *R. R. P. H.*
Alliaria officinalis	Sauce Alone, April 23, A. *P. H.*
Brassica Rapa	Turnip, full flower April 12, *P. T.* and *L. C. C.*
* B. oleracea	Cabbage, in bud April 12, *R. R. P. H.*
* Lunaria biennis	Honesty, April 18.
Sinapis arvensis	Charlock, by April 28, *A. H. B. R.*
Lepidium campestre	Pepper-wort, in bud April 30, *R. R. P. H.*
Capsella Bursa-pastoris	Shepherd's Purse, April 16, *R. R. P. H.*
Viola sylvatica both varieties)	Wood Violet, April 11, *R. R. P. H.*
V. tricolor	
(*Var.*) arvensis	Heartsease, April 17, *G. F. R.*
Arenaria trinervis	Three-nerved Sandwort, April 30, *R. R P. H.*
Stellaria Holostea	Stitchwort, April 12, *R.R.P.H.*
Cerastium glomeratum	Broad-leaved Mouse-ear, April 16, *A. H. B. R.*
Tilia Europæa	Lime Tree, leaves April 27, *C. M. B.*; trees not green by April 30.
Acer campestre	Maple, young leaves April 27, *G. F. R.*
A. Pseudo-platanus	Sycamore, in bud April 30, *R. R. P. H.*
Æsculus Hippocastanum	Horse Chestnut, trees green April 22.
Geranium molle	Dove's-foot Crane's-bill, April 28, *P. T.* and *T. E. M.*
G. Lucidum	Shining Crane's-bill, April 28, *P. T.* and *T. E. M.*
G. Robertianum	Herb Robert, April 30, *R. R. P. H.*

Oxalis Acetosella	Wood Sorrel, full flower April 23, *J. J. P.*
Euonymus Europœus	Spindle, bushes green April 25.
Trifolium pratense	Purple Clover, April 30, *G. F. R.*
Vicia sepium	Bush Vetch, April 27, *R. R. P. H.*
Lathyrus macrorhizus	Tuberous Vetch, April 24, *A. P. H.*
Prunus communis (*Var.*) spinosa	Sloe, April 8, *G. F. R.*
P. Avium	Wild Cherry, leaf April 17, *R. B. F.*; flower, April 18 (not general) *H. S. S.* Occurs at Rabley, Dead Man's Copse, Wan's Dyke, Brimslade.
Fragaria vesca	Strawberry, April 25, *J.J.P.*
F. ELATIOR	Hautboy Strawberry, April 30, near Martinsell *R. R. P. H.*
Geum Rivale	Water Avens, April 1.
Cratægus Oxyacantha	Hawthorn, leaf April 5, *C. J. C.*; hedges not universally green by April 30.
	Pear, flower in warm garden April 20.
	Apple, flower in warm garden April 27.
	Plum, flower in warm garden April 1.
* Ribes Grossularia	Gooseberry, April 1, *G. F. R.*
* R. rubrum	Red Currant, April 14, *T.L.*; April 9 in a warm garden.
* R. Sanguinea	Scarlet Ribes, April 1 (in a warm spot), generally in flower about a week later.
* R. aureum	Golden Ribes, by April 18.
Saxifraga tridactylites	Rue-leaved Saxifrage, April 12, *R. R. P. H.*
S. granulata	Meadow Saxifrage, April 25, *R. R. P. H.*; not generally in flower till a fortnight later.
Anthriscus sylvestris	Wild Chervil, April 13, *W. W. D.*
Sambucus nigra	Elder, full leaf April 1, *L. C. C.*
Viburnum lantana	Mealy Guelder-Rose, buds bursting April 22, *E. F. S.*; buds nearly out by April 30.
V. opulus	Guelder-Rose, leaf and flower buds, April 30, *R. R. P. H.*
V. Laurustinus	Just in flower February 10, not in full flower by April 30.
Galium cruciatum	Crosswort, April 27, *A. P. H.*
Valeriana dioica	Marsh Valerian, coloured buds, April 25, *A. H.*
Valerianella olitoria	Corn Salad, April 27.

Leontodon Taraxacum	
(*Var.* b)	April 2, at Savernake.
(*Var.* c)	April 8, *G. F. R.* (generally distributed on the Downs).
* Doronicum Pardalianches	Leopard's Bane, just out April 28.
Ligustrum vulgare	Privet, bushes green April 25.
Fraxinus excelsior	Ash, a few in flower by April 25.
* Syringa vulgaris	Lilac, coloured buds by April 30.
Vinca major	Greater Periwinkle, April 15, *R. R. P. H.*
Gentiana acaulis	About April 3, full flower April 27.
Pulmonaria officinalis	Lungwort, April 8, *M. O. A.*
Symphytum officinale	Comfrey, just coming into flower April 28, *G. F. R.*
Lithospermum arvense	Corn Gromwell, April 20 (not generally in flower).
Myosotis Arvensis	Field Scorpion Grass, April 16.
M. Collina	Early ditto, by April 23, *J. J. P.*; found in field near College by *J. H. J.*; near Martinsell by *R. R. P. H.*; and on Marlborough Downs by *J. J. P.*
Linaria Cymbalaria	Ivy-leaved Toad-flax, April 26.
* Scrophularia vernalis	Yellow Figwort, April 1.
Pedicularis sylvatica	Red Rattle, April 30, *H. R. P.*
Veronica Chamædrys	Germander Speedwell, April 28, *H. B. F. R.*
Lamium amplexicaule	Henbit, April 28, *A. H. B. R.*
L. album	White Dead Nettle, April 1, *G. F. R.*
L. Galeobdolon	Archangel, April 30, *R. R. P. H.*
* L. Maculatum	Spotted Dead-Nettle, coming well into flower April 1.
Ballota fœtida	Stinking Horehound, in bud April 30, *T. E. M.*
Ajuga reptans	Bugle, coloured buds April 30, *A. H.* and *E. F.*
Primula vulgaris	Primrose, a few in flower at Christmas, not generally in flower till April.
P. veris	Cowslip, April 5, *Mrs. Blake*, not generally out till about a fortnight later.
Plantago lanceolata	Ribwort, April 23, *R. R. P. H.*
* Asarum Europæum	Asarabacca, April 1.
Rumex Acetosa	Sorrel, April 30, *R. R. P. H.*
Euphorbia amygdaloides	Wood Spurge, April 30, *R. R. P. H.*
Ulmus suberosa	Common Elm, hedges of it green in warm spots, trees not green by end of April.

U. Montana	Wych Elm, trees not green by end of April.
Salix Caprea	Great Sallow, full-sized leaves about April 22.
POPULUS ALBA	White Poplar, young leaves near Martinsell and at Lockeridge, April 30, *R. R. P. H.*
Betula glutinosa	Birch, trees green April 25.
Fagus sylvatica	Beech, a few trees in very favoured spots green by April 24; not generally in leaf by April 30. Barren catkins in bud April 27, *J. W. P.*
Quercus Robur	Oak, generally leafless by April 30.
Corylus Avellana	Hazel, a few young leaves April 2, *R. R. P. H.* buds bursting April 14, T. *L.*; fertile flowers still out April 14, *G. F. R.*; bushes not green by April 30.
Juglans regia	Walnut, young leaves with unopened barren catkins, May 1, *A. M.*
Larix Europæa	Larch, cones open by April 1; trees green April 25.
Orchis mascula	Early Purple Orchis, April 24, *M. O. A.*
* Leucojum Æstivum	Summer Snow-flake, April 10.
Polygonatum multiflorum	Solomon's Seal, full bud April 30, *E. L.*
Tulipa sylvestris	Tulip, cultivated specimens in flower about April 18; wild specimens in full flower April 23, *J. J. P.*
* Fritillaria meleagris	Snake's Head, about April 3.
* F. imperialis	Crown Imperial, about April 10.
Endymion nutans	Blue-bell, one specimen in flower March 30, *H. C. B.*; next flower observed April 13, *E. F. S.*; not in full perfection by end of April
* Muscari racemosum	Grape Hyacinth, April 1.
Luzula pilosa	Hairy Wood-rush, April 4, *H. A. E.*
L. campestris	Field Wood-rush, April 30, *R. R. P. H.* and *T. E. M.*
Arum maculatum	Cuckoo-pint, spathes open April 19, *A. G. H.*
Carex præcox	Vernal Sedge, April 22, *G. F. R.* (very abundant.)
C. paludosa	River Sedge, April 21, *W. R. C.* and *R. F. J.*
C. riparia	Great River Sedge, April 13.
Anthoxanthum odoratum	Sweet Vernal-grass, panicles Ap 30, *R. R. P. H.*

Alopecurus pratensis	Fox-tail Grass, panicle April 15, *G. F. R.*
Melica uniflora	Melic, April 27, *G. F. R.*
Equisetum arvense	Corn Horsetail, April 21, *R. F. J.*
Lastrea Filix-mas	Male Fern, fronds one foot high, April 30, *H. R. P.*
Asplenium Ruta-muraria	Wall Rue, young fronds, April 19, *A. M.*
Pteris aquilina	Brakes, fronds six inches high, April 30, *H. R. P.*
Botrychium Lunaria	Moonwort, young fronds (unopened) May 2, *H. R. P.* and *J. H. J.*
Ophioglossum vulgatum	Adder's-tongue, young fronds April 23, *P. T.* and *T. E. M.*

MAY.

Myosurus minimus	Mousetail, May 5, at Brimslade, *T. A. P.*; in seed May 15, at Pewsey, *J. H. J.* and *J. E. H.*
Ranunculus flammula	Spearwort, May 9, at Great Bedwyn (in flower) *J. J. P.* Found also at Brimslade (not in flower) *T. A. P.*
R. acris	Upright Crowfoot, May 9, at Bedwyn, *T. A. P.*; a few days later at Marlborough.
R. repens	Creeping Crowfoot, by May 3, *R. R. P. H.*; fairly out by May 9.
R. arvensis	Corn Crowfoot, May 23, *R. R. P. H.*
* R. gramineus	Grassy Crowfoot, May 12.
* Aquilegia vulgaris	Columbine, about May 12.
* Trollius Europæus	Globe Flower, May 22.
BERBERIS VULGARIS	Barberry, in bud May 13, in a hedge at Clatford, *G. F. R.*
Papaver Rhœas	Red Poppy, May 30, *J. C. P.*
P. dubium	Smooth Long-headed Poppy, May 27, *M. O. A*;
Chelidonium majus	Celandine May 1.
* Meconopsis Cambrica	Yellow Poppy, May 7.
Barbarea vulgaris	Yellow Rocket, May 16.
* Isatis Tinctoria	Woad, May 7.
* Alyssum	Yellow Alyssum, by May 1.
Cardamine sylvatica	Flower and seed (Brimslade) May 5. *T. A. P.* Found also at Bedwyn by *J. J. P.*
Raphanus Raphanistrum	Jointed Charlock, May 29, *R. R. P. H.*
Helianthemum vulgare	Rock Rose, May 22, *R. R. P. H.*

Polygala vulgaris	Milkwort, May 7, *C. A. H.*, &c.
Silene Inflata	Bladder Campion, buds May 23, *R. R. P. H.*
Lychnis Vespertina	White Campion, coloured buds May 27, *R. R. P. H.*; flower May 28.
L. diurna	Red Campion, May 8, *A. H.*
Arenaria Serpyllifolia	Thyme-leaved Sandwort, May 26, *J. J. P.*
Stellaria uliginosa	Water Chickweed—Brimslade and Bedwyn—about May 16.
* Cerastium arvense	Field Chickweed, May 16.
C. Triviale	Mouse-ear Chickweed, May 21, *J. J. P.* (probably much earlier.)
* Tilia Europæa	Lime, trees green May 19; bud June 3, *T.E.M.*
Acer Campestre	Maple, flower May 6, *G. F. R.*, leaves not fully out May 21.
A. Pseudo-platanus	Sycamore, trees not green May 25, flower May 13, *M. O. A.*
* Staphylea pinnata	Bladder-nut, May 8.
Æsculus Hippocastanum	Horse Chestnut, in flower in the Forest, May 5, *J. W. P.*, in flower May 13, lasted all the month.
* Geranium Phæum	Dusky Geranium, by May 15, *R. R. P. H.*, cultivated specimen in flower May 12.
G. dissectum	Dove's Foot, May 29, *R. R. P. H.*
G. rotundifolium	In flower May 12.
G. Sylvaticum	Wood Crane's-bill, by May 31.
Euonymus Europæus	Spindle, May 29, *R. R. P. H.*
Sarothamnus Scoparius	Broom, in full flower May 5.
* Cytisus Laburnum	Laburnum, one in flower May 15, some trees not in flower by May 31, though generally in flower by that time.
Medicago lupulina	Black Medick, May 1.
* Trifolium Ochroleucum	Scarlet Clover, May 23, *R. R. P. H.*
T. repens	Dutch Clover, May 23, *R. R. P. H.*
T. minus	Lesser Hop Trefoil, Savernake Forest, May 23, *W. W. D.*; Marlborough Downs, *J. J. P.*
Lotus corniculatus	Bird's-foot Trefoil, May 28, *J. J. P.*
L. MAJOR	Greater ditto, Bedwyn, *J. J. P.*, not in flower May 28.
Anthyllis Vulneraria	Lady's Fingers, May 21, *J. J. P.* and *T. E. M.*

Vicia Sativa	Common Vetch, May 26, *J. J. P.*; found near Martinsell by *T. E. M.*; and in the copse near Rockley, by *J. J. P.*
V. tetrasperma	Smooth Tare, Ogbourne Long Copse, May 29, *J. J. P.* and *W. R. C.*; found also on the hedge bank of the Cricket Field, by *R. R. P. H.*
Hippocrepis comosa ...	Horse-shoe Vetch, May 29, *J. W. P.* and *E. H. C*; found at Rockley by *T. E. M.*, and on White Horse Down.
Onobrychis sativa ...	Cock's-head, May 28, *A. P. H.*
* Prunus Lauro-cerasus ...	Laurel, full flower May 16, *G. F. R.*
* Sibbaldia procumbens ...	May 16.
Sanguisorba officinalis ...	Great Burnet, just in flower May 13, *W. G. N.*
Poterium Sanguisorba ...	Salad Burnet, May 8, *R. R. P. H.*
Alchemilla vulgaris ...	Lady's Mantle, May 5, *J. H. J.* and *J. E. H.*
Potentilla anserina ...	Silver-weed, May 21, *J. J. P.* and *T. E. M.*
P. Tormentilla	Tormentil, May 9, *J. J. P.*
Geum urbanum	Wood Avens, by May 4, in a warm locality; May 22, *R. R. P. H.*
Cratægus Oxyacantha ...	Hawthorn, first flower May 14, *J. E. H.* and *J. H. J.*; fully out May 31.
* Amygdalus communis ...	Sweet Almond, flower in warm garden May 10.
Pyrus Malus (acerba) ...	Crab Tree, May 7, *R. R. P. H.*
(tomentosa) ...	Full flower, May 11, *R. R. P. H.*
* P Aucuparia	Mountain Ash, full flower May 20.
MONTIA FONTANA ...	Water Blinks, Savernake Forest, in seed May 23, *W. W. D.*
Spergula arvensis ...	Corn Spurrey, flower and seed, May 15, *J. H J.* and *J. E. H.*
Scleranthus annuus ...	Knapwell, May 15, *J. H. J.* and *J. E. H.*
Sedum Telephium ...	Orpine, near Martinsell, *W. W. D.*
S. ANGLICUM	English Stonecrop, Devil's Den, *G. F. R.* (probably this species.)
S. REFLEXUM	Yellow Stonecrop near the "Ailesbury Arms," at Clatford, *H. A. E.*
* S. Rhodiola	Rose-Root, May 7.
* Saxifraga umbrosa ...	May 8.
* S. Geum	May 7.
Sanicula Europæa ...	Sanicle, May 7, *R. R. P. H.*
Bunium flexuosum ...	Pignut, May 22, *R. R. P. H.*

HYDROCOTYLE VULGARIS...	Marsh Penny, Bedwyn, *J. J. P.* (not in flower) May 9.
Pastinaca sativa... ...	Parsnep, full bud May 13, *W. G. N.*
Daucus Carota	Carrot, just in flower May 26, *R. R. P. H.*
Scandix Pecten-veneris...	Shepherd's Needle, May 9, *R. R. P. H.*
Cornus Sanguinea ...	Dogwood, coloured buds May 21.
Viburnum lantana ...	Mealy Guelder Rose, May 5, *J. H. J.* and *J. E. H.*, not generally out till about three weeks later.
V. opulus...	Guelder Rose, cultivated specimens nearly out May 27, *G. F. R.*
* Lonicera Caprifolium ...	Honeysuckle, May 20, *R. R. P. H.*
Sherardia arvensis ...	Blue Sherardia, May 4, *R. R. P. H.*
Asperula odorata ...	Woodruff, cultivated, May 7; wild, May 10, *T. E. M.*
Galium aparine	Cleavers, May 10, *J. H. J.* and *J. E. H.*
Valeriana dioica	Marsh Valerian, May 3, *R. F. I.* and *W. R. C.*
* Centranthus ruber ...	Spur Valerian, May 23.
Dipsacus sylvestris ...	Teasel, Polton (not in flower) *J. J. P.*
Eupatorium Cannabinum	Hemp Agrimony, Roundhill Copse, (not in flower) *J. J. P.* and *W. R. C.*
Chrysanthemum Leucanthemum	Ox-eye, May 20, *A. C. A.*
Matricaria inodora ...	Corn Chamomile, just in flower May 20, *P. T.*
SENECIO CAMPESTRIS ...	Fleawort, in bud (Rabley Down), May 21, *T. E. M.*
Carduus crispus	Welted Thistle, May 21, *T. E. M.*
Apargia hispida	Hawkbit, May 29, *R. R. P. H.*
* Tragopogon porrifolius ...	Purple Goat's-beard, May 22.
Sonchus oleraceus ...	Sowthistle, May 29, *A. M.*
S. asper	Sowthistle, May 29, *A. M.*; *R. R. P. H.*
* Doronicum Pardalianches	Leopard's-bane, May 2.
CREPIS BIENNIS	Rough Hawk's-beard, by May 28, *R. R. P. H.*
Hieracium Pilosella ...	Creeping Mouse-ear, May 22, *J. C. P.*
* Rhododendron sp. ...	by May 20.
Ilex Aquifolium	Holly, full flower May 24.
Fraxinus excelsior ...	Ash, leaf buds bursting May 13; trees green May 31.
* Syringa vulgaris... ...	Lilac, flower May 7 (over June 9.)
Symphytum officinale ...	Comfrey, not generally out till about May 13.

Myosotis versicolor	Yellow and blue Scorpion Grass, flower and seed, May 22, at Lockeridge, *R. R. P. H.* Found also near Martinsell by *H. T. S.*
Scrophularia nodosa	Knotted Figwort, May 29, *Mrs. Blake.*
Melampyrum pratense	Cow-wheat, May 26, *R. R. P. H.*
Rhinanthus Crista-galli	Yellow Rattle, May 26, *R. R. P. H.*
Veronica Serpyllifolia	Thyme-leaved Speedwell, May 7, *R. R. P. H.*
V. arvensis	Wall Speedwell, May 15, *A. H. B. R.*
* Salvia Verbenaca	Clary, bud May 16; in flower shortly after.
TEUCRIUM SCORODONIA	Wood Sage, hedge near Sergeant Doole's, *T. A. P.*
Ajuga reptans	Bugle, May 5, *J. H. J.* and *J. E. H.*
Anagallis arvensis	Pimpernel, May 23, *R. R. P. H.*
Chenopodium Bonus-Henricus	All-good, May 6, *P. T.* and *L. C. C.*
Rumex Acetosella	Sheep's Sorrel, May 26, *R. R. P. H.*
Thesium humifusum	Bastard Toad-flax, Downs near Rabley, *J. J. P.*
Urtica Dioica	Stinging Nettle; May 15, *R. R. P. H.*
Ulmus suberosa	Common Elm, trees tinted May 10; full leaf May 22.
U. montana	Wych Elm, trees not green till May 31.
Betula glutinosa	Birch, fertile catkins, May 2, *R. R. P. H.*; barren catkins, May 5, *G. F. R.*
Fagus Sylvatica	Beech, barren catkins, May 4, *G. F. R.*; fertile ditto May 7, *J. H. J.* and *J. E. H.* Trees generally green May 13.
Quercus robur	Oak, young leaves and barren catkins May 2, *A. P. H.*, generally in leaf by May 31.
* *Carpinus Betulus*	Hornbeam, male catkins over by May 7. This plant is generally distributed.
* Pinus sylvestris	Scotch Fir, barren flower May 9; young cones May 21, *G. F. R.*
* Paris Quadrifolia	Herb Paris, May 2.
Orchis Morio	Green-winged Orchis, May 5.
O. mascula	Early Purple Orchis, white varieties found May 8, at Martinsell, by *C. A. H.*; and at Rabley, May 11, by *T. E. M.*
O. ustulata	Dwarf Orchis, May 29, *E. H. C.* and *J. W. P.*
Listera ovata	Twayblade, May 21, *J. J. P.*
Neottia Nidus-avis	Bird's-nest, May 29, *S. A. R.*

Cephalanthera grandiflora	Helleborine, young plants, probably of this species, were found in Roundhill copse by *J. J. P.* and *W. R. C.*
* Iris Germanica	German Iris, May 22, *R. R. P. H.*
* Ornithogalum umbellatum	Star of Bethlehem, May 7.
* Convallaria majalis	Lily of the Valley, as early as May 10, not generally in flower till about 10 days later.
* Allium molle	May 12.
POTAMOGETON LUCENS	Shining Pondweed, in the canal at Savernake.
P. PECTINATUS	Canal near Savernake (probably this species.)
Carex vulpina	Great Rough Sedge, May 9.
C. glauca	Glaucous Sedge, May 5.
C. sylvatica	Wood Sedge, May 9, *R. R. P. H.*
* C. pendula	Pendulous Sedge, May 8.
C. PULICARIS	Flea Sedge, Bedwyn Common, May 9, *J. J. P.* (probably this species).
Alopecurus geniculatus	Floating Foxtail Grass, May 29, *J. J. P.*
Milium effusum	Millet, panicles appearing May 10, *T. E. M.*
Poa trivialis	Rough Meadow-grass, panicles May 8, *J. H. J.* and *J. E. H.*
P. pratensis	Common Meadow-grass, panicles May 6, *G. F. R.*
Dactylis glomerata	Cock's-foot grass, May 15, *G. F. R.*
Festuca ovina	Sheep's Fescue-grass, May 15.
Serrafalcus mollis	Lop-grass, May 9.
Lolium perenne	Rye-grass, May 4, *G. F. R.*
	Barley, ear May 10.
	Rye, ear May 15, *J. H. J.*
Equisetum arvense	Corn Horse-tail, barren fronds, May 13, *A. M.*
Botrychium lunaria	Moonwort, young fronds May 2, *H. R. P.* Found also at Bedwyn by *J. J. P.*; near Martinsell, by *T. E. M.*; and in the glade beyond the grand avenue by *G. H.*
Ophioglossum vulgatum	Adder's Tongue, April 23, *P. T.* and *T. E. M.* Found in many spots in the Forest; near Sergeant Doole's; and on Aldbourne Downs, by *J. J. P.*; and near the Eight Walks by *P. T.*

JUNE.

Papaver Argemone	Long Prickly-headed Poppy, by June 13, *T. E. M.*
P. Lecoqii	Waste Ground, Marlborough College, June 14, *R. R. P. H.*
Nasturtium officinale	Water Cress, June 6, *A. M.*
Sisymbrium officinale	Hedge Mustard, June 10, *A. H. B. R.*
Reseda lutea	Wild Mignonette, June 9.
Viola canina	Dog Violet, white and purple varieties on Ramsbury Common, June 4, *J. W. P.*
* Dianthus cæsius	Cheddar Pink, June 9.
Silene inflata	Bladder Campion, June 4, *R. R. P. H.*
Lychnis flos-cuculi	Ragged Robin, full flower June 7, *A. M.*, in the osier bed near the College; found also at Brimslade and Bedwin.
Stellaria graminea	Lesser Stitchwort, full flower, June 23, *W. G. N.*
Malva sylvestris	Common Mallow, June 19, *A. P. H.*
* Hypericum Androsæmum	Tutsan, by June 25.
H. pulchrum	Upright St. John's-wort, June 21, *R. R. P. H.*
Acer Pseudo-platanus	Sycamore, one tree in full flower June 13.
Geranium pratense	Crowfoot Crane's-bill, June 13, *H. W. H.* and *R. R. P. H.*
* G. sanguineum	Bloody Crane's-bill, June 9.
Linum catharticum	Mil-mountain, full flower June 13, *R. R. P. H.*
Rhamnus Catharticus	Buckthorn, June 6.
* Cytisus Laburnum	Laburnum, some trees finished flowering, others only just coming into flower, June 9.
GENISTA TINCTORIA	Dyer's Green-weed, Clatford Vale, in bud June June 13, *H. T. S.*
Ononis arvensis	Rest-harrow, Clench, in flower June 13.
Vicia Sylvatica	Wood Vetch, by June 23.
V. Cracca	Tufted Vetch, June 19, *R. R. P. H.*
Lathyrus pratensis	Everlasting Tare, June 8, *R. R. P. H.*
Spiræa Ulmaria	Meadow-sweet, in bud June 6, *R. R. P. H.*, not in flower by June 30.
Fragaria vesca	Strawberry, ripe fruit (wild) June 23, *W. G. N.*
Rubus Idæus	Raspberry, June 4, *R. R. P. H.*
Rubus	Blackberry, a very few flowers out as early as June 6, *R. R. P. H.*, not generally in flower by June 30.

R. Cæsius	Dewberry, June 1, *E. A. K.*
Rosa canina	Dog Rose, June 9, *R. R. P. H.*
R. arvensis	Trailing Dog Rose, bud June 11, *T. E. M.*, in flower shortly afterwards.
R. micrantha	by June 23.
Cratægus oxyacantha	Hawthorn, in full perfection June 13.
Epilobium montanum	Broad-leaved Willow Herb, June 13, *R. R. P. H.*
Sedum acre	Biting Stonecrop, full flower by June 20.
* Philadelphus coronarius	Syringa, June 8, *C. E. G.*, *A. M.*, &c.
Ægopodium podagraria	Goutweed, by June 1.
Œnanthe crocata	Water Dropwort, June 6.
Heracleum Sphondylium	Hogweed, June 4.
Torilis anthriscus	Hedge Parsley, June 4.
Chærophyllum Temulum	Rough Chervil, bud June 11, *T. E. M.*, in flower very shortly afterwards.
Cornus sanguinea	Dogwood, June 19, *R. R. P. H.*
Sambucus nigra	Elder, just in flower June 2, *A. H. B. R.*; June 3, *W. G. N.*
Viburnum opulus	Guelder Rose, barren flower June 3, *T. E. M.*
Lonicera periclymenum	Honeysuckle, June 6, *R. R. P. H.*
* Symphoricarpos racemosa	Snowberry, by June 28.
Asperula Cynanchica	Quinancy-wort, full bud June 13, *R. R. P. H.*, flower June 23, *W. G. N.*
Gallium Mollugo	Great Bastard Madder, June 15, *R. R. P. H.*
G. verum	Lady's Bedstraw, bud June 11, *T. E. M.*, nearly out June 29.
G. saxatile	Smooth Heath Bedstraw, June 7, *A. P. H.*
Valeriana officinalis	Valerian, June 21, *F. J. H. J.*
Valerianella dentata	Narrow-fruited Corn Salad, June 21, *R. R. P. H.*
Knautia arvensis	Field Scabious, June 8, *R. R. P. H.*
Anthemis arvensis	Corn Chamomile, June 8 (near Martinsell), *R. R. P. H.*
A. cotula	Mayweed, June 19, *R. R. P. H.*
Achillea millefolium	Yarrow, June 21, *R. R. P. H.*
* A. tomentosa	by June 9.
Filago Germanica	Cudweed, June 14, *G. F. R.*
Senecio Jacobæa	Ragwort, in bud June 11, *T. E. M.*, not out June 29.
Centaurea nigra	Black Knapweed, June 11, *T. E. M.*
C. Scabiosa	Great Knapweed, June 8, *R. R. P. H.*

Carduus lanceolatus	Spear Thistle, bud June 4, *T. E. M.*; not out June 29.
C. palustris	Marsh Thistle, June 13, *T. E. M.*
* Silybum marianum	Milk Thistle, June 9.
Lapsana communis	Nipplewort, by June 28.
Hypochœris radicata	Cat's-ear, June 3, *R. R. P. H.*
Tragopogon minor	Goat's-beard, June 7, *J. C. P.*
Crepis virens	Smooth Hawk's-beard, June 8, *R. R. P. H.*
Hieracium boreale	Shrubby Hawk-weed, in bud June 8, Martinsell, *R. R. P. H.*; in flower, Martinsell, June 14, *T. E. M.*
Campanula glomerata	Clustered Bell-flower, June 21, *Atthill.*
Menyanthes Trifoliata	Bog-bean, by June 6, *H. R. P.*
Convolvulus arvensis	Field Bindweed, June 14, *W. W. D.*
Cynoglossum officinale	Hound's-tongue, June 6, *G. F. R.*
Solanum Dulcamara	Bitter-sweet, June 11, *T. E. M.*
* Atropa Belladonna	Deadly Nightshade, June 9.
Hyoscycamus niger	Henbane, June 6, Forest Hill, *H. M. H.*; found also in the Forest, near Iveson's Farm, by *W. W. D.*
Orobanche minor	Lesser Broom-rape, June 15, *J. J. P.*, in the Marlborough Water Meadows.
O. elatior	Tall Broom-rape. A specimen, probably of this species, found in a very young state, near the Butts, by *A'Court.*
Verbascum Thapsus	Great Mullein, June 25, *F. J. H. J.*
Linaria vulgaris	Yellow Toad-flax, June 11, *S. A. R.*
* Digitalis purpurea	Foxglove, June 9.
Eupharsia odontites	Red Bartsia, June 25, *R. R. P. H.*
Veronica Beccabunga	Brooklime, June 6, *H. A. M.*
V. officinalis	Common Speedwell, June 19, *J. W. P.*
Thymus serpyllum	Wild Thyme, June 4, *E. L.*
Prunella vulgaris	Self-heal (white variety), June 25, *R. R. P. H.*
Stachys sylvatica	Hedge Woundwort, June 11, *T. E. M.*
Plantago media	Lamb's Tongue, June 4, *H. R. A.*
Rumex conglomeratus	Sharp Dock, June 28.
R. obtusifolius	Broad-leaved Dock, by June 28.
R. crispus	Curled Dock, in flower June 28.
Populus nigra	Black poplar, in leaf about June 10.
Corylus Avellana	Hazel; fully-formed fruit, June 13, *T. E. M.*

* Castanea vulgaris	Sweet Chestnut, unopened catkins June 11, *T. E. M.*
Tamus communis	Black Bryony, June 10, *A H. B. R.*
Orchis maculata	Spotted Hand Orchis, June 6, *G. F. R.*
O. pyramidalis	Pyramidal Orchis, June 21, Martinsell, *R. R. P. H.* Found also on White Horse Down by *S. A. R.*, and on Pewsey Hill by *R. R. P. H.*
Gymnadenia Conopsea	Red-handed Orchis, June 21, *R. R. P. H.*
Habenaria viridis	Frog Orchis, near Rabley Copse, June 19, *R. R. P. H.*
H. chlorantha	Butterfly Orchis, June 11, *S. A. R.*
OPHRYS APIFERA	Bee Orchis, Martinsell, June 17, *A. A.*
Iris Pseud-acorus	Yellow Flag, by June 6, *H R. P.*
* Allium schænoprasum	Chives, June 9.
Juncus effusus	Common Soft Rush, in bud June 13, *R. R. P. H.*
CAREX HIRTA	Hairy Sedge, College bathing place, in seed June 15, *G. F. R.*, probably this species.
Phalaris arundinacea	Reed-grass, panicles appearing June 28.
Phleum pratense	Timothy-grass, June 14, *J. W. P.*
Alopecurus agrestis	Black-grass, June 6, *G. F. R.*
Holcus lanatus	Soft-Grass, June 13, *R. R. P. H.*
Aira cæspitosa	Hair Grass, panicles appearing June 28.
Trisetum flavescens	Yellow Oat-grass, June 14, *J. W. P.*
Arrhenatherum avenaceum	Oat-grass, by June 13.
Kœleria cristata	Crested Hair-grass, about June 6.
Briza media	Quaking Grass, June 2, *J. W. P.*
Cynosurus Cristatus	Dog's-tail Grass, about June 6.
Bromus sterilis	Barren Brome-grass, full flower June 28.
Triticum repens	Couch Grass, June 28.
	Wheat, flower June 13, *R. R. P. H.*
	Oats, panicles June 13, *R. R. P. H.*
Lastrea filix-mas	Male Fern, fructification June 4, *T. E. M.*
L. Oreopteris	Sweet Mountain Fern, full-sized fronds June 13, *G. A. H.*

ENTOMOLOGY.

In Entomology a very fair amount of work has been done, especially when the very unfavourable state of the weather is taken into account. By members of the School fifteen new species have been added to our List, and some progress has been made towards obtaining a proper List of the small Moths, though the intervention of the holidays presents an almost insuperable barrier to any fair degree of success in that line. As in Botany, great want is felt for the co-operation of residents in the neighbourhood, and therefore we are very glad to secure one, Mr. Henry Selfe, of Marten, near Burbage; yet even he is out of our range, and we can only secure his assistance in a very limited degree.

We are anxious to do more in the way of rearing of insects, and of thereby obtaining their life histories. Some progress has been made in this, especially by Dayman, which we hope will be carried on successfully by other members of the section next half-year. We cannot close these remarks without expressing our regret at losing our "Captain" next Michaelmas, and our earnest hope that some member of the Society, of a sufficiently high standing in the school, will come forward to fill his place.

Names of those whose initials are given in the following List:—

M. O. A.	M. O. Alison
A. C. A.	A. C. Almack
H. G. B.	H. G. Bailey.
A. B.	A. Bell.
H. B.	Rev. H. Bell.
R. H. B.	R. H. Brown.
L. C. C.	L. C. Calley.
C. H. C.	C. H. Chadwick.
J. G. C.	J. G. Crosse.
E. H. D.	E. H. Davis.
R. C. D.	R. C. Davis.
W. W. D.	W. W. Dayman.
R. H. D.	R. H. Duthie.
W. D. F.	W- D. Fenning.
J. E. H.	J. E. Hilliard.
A. C. H.	A. C. Hilton.
H. M. H.	A. M. Hilton.
H. W- H.	H. W. Hockin.
G. H.	G. Holden.
F. J. H. J	F. J. H. Jenkinson.
J. H. J.	J. H. Johnson.

E. A. K.	E. A. King.
G. A. L.	G. A. Lefroy.
R. B. M.	R. B. Mainwaring.
E. B. M.	E. B. Maitland.
W. M.	W. Mansell, Esq.
A. M.	A. Marshall.
H. C. O.	H. C. Oakley.
J. C. P.	J. C. Palmer.
D. D. P.	D. D. Passy.
C. E. P.	C. E. Powell.
W. J. P.	W. J. Pratt.
T. A. P.	Rev. T. A. Preston.
J. C. R.	J. C. Rogers.
G. F. R.	G. F. Ruck.
H. S.	Mr. Henry Selfe, Burbage.
J. S.	Rev. J. Sowerby.
H. T. S.	H. T. Stainton, Esq., Lewisham.
R. P. V.	R. P. Van Heythuysen.
R. W. W.	R. W. Wickham.

LEPIDOPTERA.

Gonepteryx Rhamni	Brimstone, seen March 6, *E. A. K.*
Pieris Brassicæ	Large White, April 30, *A. M.*
P. Rapæ	Small White, April 20 to 22.
P. Napi	Green veined White, seen April 22, *L. C. C.*
Anthocharis Cardamines	Orange Tip, April 22, *A. C. A.*
Leucophasia Sinapis	Wood White, June 21, *J. H. J.*
Lasiommata Ægeria	Speckled Wood, June 8, *J. H. J.*
L. Megæra	Wall, May 19, *H. W. H.*
Hipparchia Janira	Meadow Brown, seen May 23, *H. W. H.*; caught June 15, *J. E. H.*
Cænonympha Pamphilus	Small Heath, May 19, *J. H. J.*
Cynthia Cardui	Painted Lady, seen May 15, *J.S.*; caught May 18, *J. E. H.*
Vanessa Atalanta	Red Admiral, seen June 22, *A. C. H.*
V. Io	Peacock, seen March 18, *E. H. D.*
V. Polychloros	Large Tortoise-shell, seen April 29, *H. W. H.*
V. Urticæ	Small Tortoise-shell, seen during the first week in March.

GRAPTA C-ALBUM	Comma, April 18, at Marten, *H. S.*
Argynnis Selene	Small Pearl-bordered Fritillary, June 1, *A.C.H.*
A. Euphrosyne	Pearl-bordered Fritillary, May 16, *C. E. P.*
Melitæa Artemis	Greasy Fritillary, Larvæ, April 22, *H. W. H.* and *J. H. J.*; Imago taken May 22; taken also on Forest Hill, by *J. H. J.*
Nemeobius Lucina	Duke of Burgundy F., worn specimens taken Rabley Copse, June 8, *J. H. J.*
Thecla Rubi	Green Hair-streak, seen in Manton Copse June 13, *H. T. S.*
Chrysophanus Phlæas	Small Copper, May 15, *J. H. J.*
Polyommatus Alsus	Bedford Blue, May 28, *J. H. J.*
P. Alexis	Common Blue, May 23, *R. C. D.*
	A "blue butterfly" was seen May 14, by *H.B.*
P. Agestis	Brown Argus, May 28, *W. J. P.*
Thymele Alveolus	Grizzled Skipper, May 14, *J. E. H.*
Thanaos Tages	Dingy Skipper, May 16, *J. E. H.* and *J. H. J.*; taken at Rabley by *T. A. P.*
Pamphila Sylvanus	Large Skipper, seen June 3, *H. W. H.*
Procris Statices	Green Forrester, June 2, *F. J. H. J.*
Anthrocera Filipendulæ	Six-spotted Burnet, Larva, May 22, *A. M.*; Pupa, May 23, *H. M. H.*; Imago, June 13, *H. M. H.*
Smerinthus Ocellatus	Eyed Hawk, taken at Light June 10, *A. C. A.*
S Populi	Poplar Hawk, ditto June 8, *R. P. V.*
Chærocampa Porcellus	Small Elephant, Savernake Forest, June 6, *G. H.*
Macroglossa Stellatarum	Humming-Bird, seen April 22 by *Mr. Featherstone*; taken April 25, *R. W. W.*
Hepialus lupulinus	Common Swift, May 25, *E. B. M.*
H. Humuli	Ghost, June 12, *W. M.*
H. VELLEDA	Beautiful Swift, Rabley Copse, June 9, *H.M.H.*
Cerura Vinula	Puss Moth, Pupæ taken at Mildenhall by *E. H. D.*, and in the Forest by *W. W. D.*
PTEROSTOMA PALPINA	Taken at light June 17, *W. W. D.*
Lophopteryx Camelina	Coxcomb Prominent, May 15, *G. F. R.*
Pygæra Bucephala	Buff Tip, May 27, *G. F. R.*
Gnophria rubricollis	Taken in West Woods June 21, *C. E. P.* and *F. J. H. J.*
Nemeophila Plantaginis	Wood Tiger, May 28, *W. J. P.*

Phragmatobia fuliginosa	Ruby Tiger, on Railway Bank May 16, *G A.L.*
Spilosoma menthrasti ...	Large Ermine, May 22, *H. W. H.*
S. lubricepeda	Spotted Buff, June 5, *D. D. P.*
Diaphora mendica ...	Muslin, May 18, *J. H. J.*
Lasiocampa Quercus ...	Oak-Eggar, larva taken May 5, *J. H. J.*
Cilix Spinula	Chinese Character, May 19, *E. H. D.*
Drepana Falcataria ...	Pebble Hooktip, May 21, *R. C. D.*
D. Unguicula	Barred Hooktip, May 24, *W. D. F.*
Acronycta Psi	Dagger, June 18, *J. H. J.*
Xylophasia Polyodon ...	Dark Arches, June 25, *H.C.O.*
Malmestra Brassicæ ...	May 30, *R. H. D.*
Apamea Basilinea ...	June 14, *C. E. P.*
GRAMMESIA TRILINEA ...	Treble-lines, June 3, *W. W. D.*
CARADRINA CUBICULARIS	At Preshute, June 15, *A.M.*
Agrotis Exclamationis ...	May 26, *J. H. J.*
Triphæna Pronuba ...	Yellow Underwing, April 20, *M. O. A.*
TÆNIOCAMPA RUBRICOSA...	Marlborough Common, March —, *R.H.B.*
T. MUNDA...	Bred from pupa taken near Marlborough, *E. H. D.*
Phlogophora meticulosa...	Angle-shades, June 17, *Churchill.*
CALOCAMPA EXOLETA ...	Taken at Preshute, November, 1865, *W. W.D.*
Cucullia Umbratica ...	The Shark, June 25, *H. G. B.*
Plusia gamma	Silver Y., June 7.
Gonoptera Libatrix ...	Herald, April 18, *G. F. R.*
Mania typica	June 29, *T. A. P.*
Euclidia Mi	May 19, *J. H. J.*
Phytometra Ænea ...	May 23, *C. E. P.*
Rumia Cratægata ...	Brimstone, May 26, *J. E. H.*
Selenia Illunaria ...	Early Thorn, June 10, *F. J. H. J.*
Odontopera Bidentata ...	Scolloped Oak, June 5, *R. B. M.*
Amphidasis Prodromaria	Oak Beauty, *A B.*
Hemerophila Abruptaria	Waved Umbre, May 15, *E. H. D.*
Iodis lactearia	May 25, *J. E. H.*
EPHYRA PUNCTARIA ...	At Manton Copse, June 6, *J. H. J.*
Asthena Candidata ...	Small White Wave, May 23, *J. H. J.*
Lozogramma Petraria ...	Brown Silver-line, May 19, *E. H. D.*
Fidonia Atomaria ...	Heath, May 29, *J. C. R.*
Minoa Euphorbiata ...	June 4, *J. E. H.*
Ligdia Adustata	Scorched Carpet, June 2, *A. C. H.*
Lomaspilis marginata ...	Clouded Border, May 23, *J. H. J.*

HIBERNIA RUPICAPRARIA	Manton, March 4, *A. M.*
H. Progemmaria	Dotted Border, first week in March, *J. S*;
Anisopteryx Æscularia	March 18, *A. M.*
Larentia miaria	Green Carpet, May 28, *F. J. H. J.*
Emmelesia alchemillata	Small Rivulet, June 21, *H. M. H.*
E. BLANDIATA	May 29, *J. E. H.*
Eupithecia centaureata	May 19, *J. H. J.*
E. vulgata	Common Pug, May 26, *J. E. H.*
Melanippe Ocellata	Purple-bar Carpet, June 2, *H. M. H.*
M. Hastata	Argent and Sable, June 8, *A. C. H.*
M. UNANGULATA	Savernake Forest, May 27, *J. C. P.*
M. Biriviata	April 26, *R. C. D.*
M. Montanata	Silver Ground Carpet, May 28, *A. C. H.*
M. Fluctuata	Garden Carpet, April 26, *A. M.*
Anticlea Derivata	At Ramsbury, April 27, *J. G. C.*
Coremia Propugnata	May 22, *F. J. H. J.*
C. Ferrugaria	May 2, *J. H. J.*
Camptogramma Bilineata	Yellow Shell, June 6, *H. M. H.*
Cidaria Russata	Marbled Carpet, June 7, *F. J. H. J.*
C. CORYLATA	Broken-barred Carpet, June 2, *J. H. J.*
Eubolia Plumbaria	Belle, June 21; *C. H. C.*
Odezia Chærophyllata	Chimney-sweep, June 7, *A. C. A.*
Pyrausta Purpuralis	Crimson and Gold, May 22, *H. M. H.*
P. Ostrinalis	May 22, *J. H. J.*
Herbula cespitalis	May 8, *J. H. J.* (common).
ENNYCHIA ANGUINALIS	At Clatford, *H. W. H.*, &c.
BOTYS FUSCALIS	Rabley Copse, June 8, *H. M. H.*
B. urticata	Small Magpie, May 31, *H. W. H.*
Pionea forficalis	Garden Pebble, June 2, *J. H. J.*
Scopula Olivalis	White Brindled, June 10, *F. J. H. J.*
Simaethis Fabriciana	Nettle Tap, May 22, *A. E. H.*
Crambus pratellus	May 28, *J. H. J.*

ORNITHOLOGICAL SECTION.

Since the formation of this section, at the beginning of the past egging season, the study of ornithology has been carried on much more systematically than last year. Eggs have been collected with great energy and success, and several very curious varieties have been found, among which we may mention a spotless thrush's and jackdaw's. Separate meetings of this section have been frequently held, at which many of our Marlborough birds were discussed, and also any notices of them or of their eggs that had been lately recorded. Our thanks are due to several members of this section for their perseverance in collecting and regularity in the record of notices, among whom we may mention the names of E. H. Carr, J. W. Parrington, A. Herklots, and J. F. Blackburn, which will be seen to occur frequently in the following list. But, while thanking these members, we also feel it our duty to say that we should be glad to see the study of ornithology pursued rather more scientifically, while with its practical pursuit we can find no fault. We should be also glad to see more use made of the recorded notices, which will be always open to any one on application to the Head of the Section, and a more earnest attempt to become intimately acquainted with the habits and history of each of our Marlborough birds.

Unless stated to the contrary, the dates given are those on which the first eggs were taken, which in most cases are probably the first eggs laid this year.

Falco tinnunculus ...	Kestrel, April 16, *E. H. Carr*; *J. W. Parrington.*
Falco nisus	Sparrow Hawk, April 12, *E. H. Carr; A. Herklots.*
Otus vulgaris	Long-eared Owl, young bird April 18, *F. N. Roger.*
Strix flammea	White Owl, April 26, *E. H. Carr*; *E. A. King.*
Lanius collurio	Red-backed Shrike, May 6, *A. B. H. Harenc.*
Turdus viscivorus ...	Missel Thrush, egg March 28; hard set April 4, *E. W. Rooke*; young bird April 10, *L. C. Calley, P. Thursby.*
Turdus pilaris	Fieldfare, flock seen March 27, *A. Herklots.*
Turdus musicus	Song Thrush, March 25, *R. F. Isaacson.*
Turdus merula	Blackbird, March 28, *S. A. Rogers.*
Turdus torquatus ...	Ring Ouzel, April 30, *E. H. Carr, J. W. Parrington.* The bird was seen to fly off the nest.
Accentor modularis ...	Hedge Sparrow, April 4, *A. Herklots.*

Erythaca rubecula	Redbreast, April 2, *J. E. Fenwick.*
Phœnicura ruticilla	Redstart, May 3, *G. R. Green.*
Saxicola rubicolia	Stonechat, April 28, *P. Thursby, F. B. Jarvis.*
Saxibola rubetra	Whinchat, young birds, May 16, *A. Herklots, F. N. Roger.*
Saxicola œnanthe	Wheatear, May 14, *H. W. Unwin, W. F. J. Farquharson.*
Saxicola locustella	Grasshopper Warbler, May 30 (hard set), *E. H. Carr, R. B. Hamilton.* Several other nests were taken after this.
Salicaria phragmitis	Sedge Warbler, April 30, *H. W. Hockin.*
Philomela luscinia	Nightingale, heard May 8, *J. W. Parrington;* May 15, *Rev. H. E. Booth.*
Curruca atrieapilla	Blackcap, May 5, *J. H. Johnson.*
Curruca hortensis	Garden Warbler, May 26, *E. H. Carr, R B. Hamilton.*
Curruca cinerea	Common Whitethroat, May 11, *E. Freeman.*
Curruca sylviella	Lesser Whitethroat, May 15, *J. F. Blackburn, A. Herklots.*
Sylvia sylvicola	Wood Warbler, May 14, *E. H. Carr, E. L. King.*
Sylvia trochilus	Willow Warbler, May 15, *A. T. Richards.*
Sylvia hippolais	Chiff-Chaff, heard April 20, *J. W. Parrington.*
Regulus cristatus	Golden-crested Wren, Ap. 30, *J. E. Fenwick.*
Parus major	Great Tit, April 26, *L. C. Calley, P. Thursby.*
Parus cœruleus	Blue Tit, April 22, *J. E. Feuwick.*
Parus ater	Cole Tit, May 13, *J. E. Fenwick*
Parus candatus	Long-tailed Tit, April 22, *A. Herklots.*
Motacilla Yarrellii	Pied Wagtail, April 24 (hard set), *A. C. Master, F. Blackburn.*
Anthus arboreus	Tree Pipit, May 16, *A. C. Hilton, H. M. Hilton.*
Anthus pratensis	Meadow Pipit, April 29, *E. H. Carr.*
Alauda arvensis	Sky Lark, April 20, *E. A. King, E. L. King.*
Alauda arborea	Wood Lark, heard March 11, *H. W. Hockin.*
Emberiza miliaria	Common Bunting, May 12, *W. Dowding.*
Emberiza Scnœniclus	Black-headed Bunting, April 30, *E. H. Carr, E. A. King.*
Emberiza citrinella	Yellow-hammer, April 31, *L. Williams, S. Smallpiece.*
Fringilla cælebs	Chaffinch, April 20, *P. Thursby, L. C. Calley.*

Passer domesticus	House-sparrow, young birds April 19, *E. H. Carr, J. G. Crosse.*
Coccothraustes chloris	Greenfinch, April 26, *L. Williams.*
Carduelis elegans	Goldfinch, May 29, *E. H. Carr, J. F. Blackburn.*
Linota cannabina	Linnet, April 14, *E. H. Corr, J. W. Parrington.*
Pyrrhula vulgaris	Bullfinch, April 28, *E. H. Carr, E. L. King.*
Sturnus vulgaris	Starling, April 17, *E. H. Carr, J. G. Crosse.*
Corvus corax	Carrion Crow, May 12, *A. C. Master.*
Corvus frugilegus	Rook, March 19, *R. Hawkins.*
Corvus monedula	Jackdaw, by April 15, *A. Herklots, J. F. Blackburn.*
Picus caudata	Magpie, April 2, *E. A. King, E. W. Rooke.*
Garrulus glandarius	Jay, April 18, *L. C. Calley, P. Thursby.*
Picus viridis	Green Woodpecker, May 27, *E. Lloyd, H. C. Tisdall.*
Certhia familiaris	Common Creeper, April 26, *T. F. Back.*
Troglodytes vulgaris	Common Wren, April 28, *J. W. Parrington, A. Dolben.*
Sitta Europæa	Nuthatch, May 14, *E. H. Carr, J. F. Blackburn.*
Cuculus canorus	Cuckoo, heard April 11, *E. L. Bernays*; egg, May 15, *E. H. Carr, K. F. Boyd.*
Hirundo rustica	Swallow, seen April 1, *G. K. Mills*, eggs, June 10, *E. H. Carr.*
Hirundo urbica	Martin, seen May 5, *A. C. Almack*; eggs, June 11, *Rooke.*
Hirundo riparia	Sand Martin, seen April 30, *A. C. Almack*; eggs, May 15, *Maitland.*
Cypselus apus	Swift, seen April 25, *E. Tilleard*; eggs, May 9, *E. H. Carr, J. F. Blackburn.*
Columba palumbus	Ring Dove, eggs set, April 18, *J. C. Palmer.*
Columba ænas	Stock Dove, April 10, *E. H. Carr, E. A. King.*
Columba turtur	Turtle Dove, May 9, *R. Kingsford.*
Phasianus colchicus	Pheasant, April 29, *E. H. Carr, R. B. Hamilton.*
Perdix cinerea	Partridge, April 2, *E. Field.*
Ædicnemus crepitans	Stone Curlew, May 26, *H. Soames.*
Vanellus cristatus	Peewit, seen in flocks up to March 21; eggs hard set April 27, *A. H. B. Harenc*; young birds, April 27, *H. R. Parrington, C. E. Powell.*
Ardea cinerea	Heron, seen on the canal, March 27, *A. Herklots*

Scolopax gallinago	Common Snipe, seen March 28, *G. H. Dawson.* March 29, *A. C. Almack*; April 17, *J. W. Parrington.*
Crex pratensis	Land Rail, heard April 26, *H. W. Hockin*; eggs hard set June 13, *E. H. Carr, E. L. King.*
Rallus squaticus	Water Rail; one shot on the river in January; one seen April 8, *J. W. Parrington.*
Gallinula chloropus	Moorhen, April 11, *A. Herklots, J. F. Blackburn.*
Fulica atra	Coot, May 4, *F. C. Lightfoot,*
Anas boschas	Wild Duck, March 21, *E. L. King, H. M. Spencer.*
Anas crecca	Teal, seen May 3, *J. W. Parrington.*
Podiceps minor	Dabchick, April 26 (hard set) *E. W. Rooke.*

A. C. ALMACK, *Head of the Section.*

OBSERVATIONS ON THE WEATHER.

N.B.—The passages quoted are from Mr. Glaisher's Report of the Weather, published by the Registrar General.

"THE weather at the beginning of the year was stormy, with gales of wind. The temperature was high for the season. On the 11th day there fell an unusual amount of sticking snow, of great specific gravity. The snow was of that unusual dense character that six inches in depth produced water to the depth of 1½ inches nearly. A very rapid thaw set in, and within two or three days all the snow disappeared, followed, however, by rivers overflowing their banks. All the low-lying lands along the valley of the Thames were under water. The weather continued changeable throughout January, with heavy rain and gales of wind."

Such was the weather generally over England. At Marlborough there were not very strong winds till about the 7th, when they lasted for about five days. On the 21st and 22nd the wind was also high, but at other times it seems to have been very moderate, hence though the humidity was very great, it cannot be called a stormy month. On the 11th about 5¾ inches of snow fell. This I have considered equivalent to ·630 inches of rain, though, according to Mr. Glaisher, it ought be more than double that amount. The mean temperature was remarkably high, being 41·5°; for England generally it was 42·6°, and was higher than in any January since that of 1851. The mean temperature of the preceding month, December, was 42.0°, the average for England being 42·4°. "Usually January is 2·8° colder than the preceding month," yet on this occasion it was only 0.5° of lower temperature at Marlborough. "It was 4½° above the average of the previous 25 Januaries," for England generally; and at Marlborough 7·0° above the temperature of January, 1865.

"The extremely mild weather in January and the first part of February stimulated vegetation to a very unusual activity at this season. Hedges and early fruit trees were budding, and some were ready to burst into blossom. This unusual temperature continued till the 12th February, and the average excess up to this time was 6° daily. From the 13th of February till the 15th of March the weather was cold, and nearly constantly below the average of the season of the year. The average daily defect of temperature for this period was 2·9°; four days of warm weather followed, each day being about 2·0° in excess of its average temperature. This was succeeded by four days of very cold weather, the defect averaging 4¼° daily, and the quarter closed with eight days whose temperature exceeded their average by 6·0°."

"The mean temperature of February was 40·5°, being 1·9° above the average of the preceding 25 Februaries, and 3·9° above that of last year. Every month, from September to this month inclusive, has been of higher temperature than their averages to the mean amount of 3·9° nearly."

"The mean temperature of March was 40·5°, the same as in February, being 1·2° below the average of the preceding 25 years, and 3·9° above that of last year."

Upon comparing these results with those given in the table, it will be seen that the weather at Marlborough has been very similar to what it was over England generally. February and March were a little colder; but the general variations of temperature were similar. The weather in those months was remarkably changeable, and very damp, accompanied with strong winds and hurricanes, producing a very large amount of sickness. Snow fell frequently, though not to any great amount.

During April the temperature continued to increase steadily, though not rapidly (with but slight intermissions, from the 8th to the 13th), till the 24th, when it rose rapidly. The 26th and 27th were very hot, but on the 28th the temperature fell, and by the 29th the maximum temperature was no less than 28° lower than it was on the 27th, and a very cold period set in. The mean temperature of the month was below that of 1864, and far below that of last year. The month, as a whole, was not a healthy one; the weather was very changeable, there being no less than 14 ground frosts, and the wind very high at times, accompanied with much rain. "The sudden drying weather (on the 26th and 27th) caused large tracts of land at all parts of the country to be in such a heavy state that Spring operations, particularly sowing, were much impeded, and, in fact, agricultural purposes generally were in a backward state. The budding of trees was in general late, but at places where they had not already shot out their leaves the effect of this weather was extraordinary, the leaves appearing, and fruit trees blossoming so suddenly, that the whole aspect was changed in a few hours."

The cold weather on the 29th seriously affected all the crops, and cut off much of the blossom from fruit trees. The growth of wheat, barley, and oats was much retarded, although in some very rich lands the cereal crops had in a measure recovered by the end of May. Pasture land made little or no progress, and rain was much required."

The weather during May was very unsettled. The cold period which began on the 29th of April continued during the early part of May, so that snow fell on the 4th. The temperature reached its maximum on the 19th, but has been very variable throughout the month. At night it has been exceedingly cold, the thermometer on the ground being above freezing on eleven nights only during the whole month.

"On June 2nd the weather again changed, and became much warmer, and a mean daily excess over the average temperature occurred to the amount of 4·2° till the 11th day. A similar cold period followed, but on the 21st day the temperature again increased considerably, and fine weather followed till the end of the quarter, the mean daily excess of temperature amounting to nearly 5°. By this time the crops were generally in a pretty favourable condition—haymaking had progressed well, though somewhat below the average in quantity. There were some fears that the wheat crop would be light. Potatoes were promising, and free from disease. To the end of the quarter there were no choleraic meteorological symptoms."

	Mean height of Barometer.		Monthly range.		Mean temperature of air.		Mean daily range.		Maximum in shade.		Minimum in shade.		Maximum in sun.		Minimum on Grass.		Mean degree of Humidity		Mean amount of Cloud.		Amount of Rain.		No. of days on which it fell.	
	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865
	in	in	in	in	°	°	°	°	°	°	°	°	°	°	°	°					in	in		
JANUARY ...	29·375	29·109	1·778	1·764	41·5	34·4	12·7	11·8	58.8	50·1	16.1	5·8	85·1	74·7	13·8	3·2	89.2	92·0	7·8	6·8	4·400	3·858	23	18
FEBRUARY	29·227	29·411	1·770	1·716	39·7	35.2	13·2	11·2	58.6	49·8	37·2	17·4	88·9	104·9	15·5	9·7	90.4	93·5	7·2	8.4	3·857	2·344	22	19
MARCH......	29·221	29·431	1·340	1·110	39·5	35·6	14·9	13·9	61·6	51·7	15·3	21·8	115·9	110·8	12·6	11·8	86.4	81·9	7·9	8·0	2·327	1·206	20	15
APRIL......	29·430	29·649	0·986	0·524	46.3	52·0	15·8	24·3	72·8	77.6	30·0	29·4	122·0	129·9	20·5	16.0	83.7	73·5	7·0	4·7	2·393	0·988	21	8
MAY	29·512	29·457	0·872	0·854	48·8	53·8	21·0	21·7	70·9	78·0	25·7	33·2	122·5	135.7	18·3	24.4	67.4	80·0	5·8	7·3	1·919	2·622	10	22
JUNE	29·469	29·740	0·814	1·280	58·8	59·8	19·4	25·1	81·0	88.7	39·7	37·5	121·0	149·0	42·2	29·0	78.0	69·5	6·6	5·4	3·238	2·827	18	6
MEAN......	29·372	29·466	1·260	1.208	45·8	45·1	16·2	18·0	...	...	...	...	...	...	...	...	82·5	81·7	7.0	6·3	...	...	...	...

Total amount of rain during the six months in 1866, 18·134 inches; in 1865, 13·845 inches.

	Mean height of Barometer.		Monthly range.		Mean temperature of air.		Mean daily range.		Maximum in shade.		Minimum in shade.		Maximum in sun.		Minimum on Grass.		Mean degree of Humidity		Mean amount of Cloud.		Amount of Rain.		No. of days on which it fell.	
	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865
	in	in	in	in	°	°	°	°	°	°	°	°	°	°	°	°					in	in		
JANUARY ...	29·375	29·109	1·778	1·764	41·5	34·4	12·7	11·8	58.8	50·1	16.1	5·8	85·1	74·7	13·8	3·2	89.2	92·0	7·8	6·8	4·400	3·858	23	18
FEBRUARY	29·227	29·411	1·770	1·716	39·7	35.2	13·2	11·2	58.6	49·8	37·2	17·4	88·9	104·9	15·5	9·7	90.4	93·5	7·2	8.4	3·857	2·344	22	19
MARCH......	29·221	29·431	1·340	1·110	39·5	35·6	14·9	13·9	61·6	51·7	15·3	21·8	115·9	110·8	12·6	11·8	86.4	81·9	7·9	8·0	2·327	1·206	20	15
APRIL......	29·430	29·649	0·986	0·524	46.3	52·0	15·8	24·3	72·8	77.6	30·0	29·4	122·0	129·9	20·5	16.0	83.7	73·5	7·0	4·7	2·393	0·988	21	8
MAY	29·512	29·457	0·872	0·854	48·8	53·8	21·0	21·7	70·9	78·0	25·7	33·2	122·5	135.7	18·3	24.4	67.4	80·0	5·8	7·3	1·919	2·622	10	22
JUNE	29·469	29·740	0·814	1·280	58·8	59·8	19·4	25·1	81·0	88.7	39·7	37·5	121·0	149·0	42·2	29·0	78.0	69·5	6·6	5·4	3·238	2·827	18	6
MEAN......	29·372	29·466	1·260	1.208	45·8	45·1	16·2	18·0	...	...	...	...	...	...	...	...	82·5	81·7	7.0	6·3	...	...	...	...

Total amount of rain during the six months in 1866, 18·184 inches; in 1865, 13·845 inches.

REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

FOR THE

HALF-YEAR,

ENDING CHRISTMAS, 1866.

> "Tum mihi Naturæ libeat perdiscere mores,
> Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH:
Printed and Published by C. Perkins, Times Office.
1867.

PREFACE.

To be restlessly desirous of rapid and striking progress, is not a wise or favourable attitude for either the Committee or the Members of a Scientific Society.

"Science moves but slowly, slowly,"

is no more or less than the fact. And the students of Science should be content to move slowly too, provided that their operations are not stagnating, and that their advance, if slow, is nevertheless sure. In making another half-yearly record of the life of our Society, we may congratulate the Members on this kind of steady progress. We have nothing startling to announce, but we can speak of a good many points made in the right direction.

For example, we have had an excellent paper on the geology of the drift-beds in the neighbourhood, by S. B. Dixon, Esq., of Pewsey. This is the kind of co-operation we want—the aid of scientific observers who are, so to speak, within our own circle of observation, but a little beyond those points which we are able to reach by our ordinary means of locomotion. Another token of neighbourly interest may be mentioned. Mr. J. Coleman, of East Kennett, has presented the Society with a Phalarope (*Phalaropus Lobatus*), shot by himself. Our President had noticed in the *Marlborough Times* the announcement of such a bird having been shot, the paragraph stating that the bird was a Stormy Petrel. It was through his vigilance and active inquiry that the bird was properly classified, and eventually presented by the owner to the Museum. We earnestly hope that persons living in and near Marlborough will kindly come forward more and more actively in aid of our observations and collections.

Until the unfavourable weather set in, all the Society's Sections were in active and more systematic progress. We must not omit to mention that the Geological Section (led and stimulated by Mr. Mullins), made two excursions, to Bicknell, and to Swindon.

The Library is moving forward. Professor Newton, of Cambridge, has presented a copy of his valuable *Ootheca Wolleiana*, an account of the splendid egg collections left by the late Mr. Wolley. The Rev. J. M. Fuller continues to supply the *Intellectual Observer* and *Popular Science Review*. The President has contributed complete sets of the *Entomologist* and the *Entomologist's Monthly Magazine*, besides the *Ornithological Dictionary*, and other useful presents. Herklots has added *Cassell's Birds*. Even while this preface was passing through the press, we became indebted to Mrs. Gray, of the British Museum, for a valuable collection of sea-weeds, which will receive full notice in our next report.

We certainly have gained system and organization from the opening of the Museum-room, a measure for which the Society feels sincerely grateful to the Council of Marlborough College. A vote of thanks was formally passed at one of our Meetings, and a copy duly forwarded to the Chairman of the Council, but we gladly embrace this further opportunity of recording our sense of what has been a real boon to the study of Natural History in the School. More system, more organization we still want, and shall always (let us hope) continue to wish for more. "Harmony in the whole, energy in the parts," should be our motto.

We may add that the *Report* has been most kindly received, and in several cases very carefully and critically noticed, by several well-known men of science. To Dr. Hooker, of Kew, we are indebted for a new method of tabulating our observations, which was suggested in a letter to the President, acknowledging the receipt of the *Report*.

To the President, our debt of gratitude accumulates. Without his unvarying interest and perseverance we should not be able to make the record we have now done.

MARLBOROUGH COLLEGE NATURAL HISTORY SOCIETY.

PRESIDENT.

* Rev. T. A. Preston.

SECRETARY.

W. R. Carles.

TREASURER.

T. R. Dumergue.

LIBRARIAN.

R. F. Isaacson.

COMMITTEE.

The Ex-officio Members.
* C. A. Harrison.
R. F. Isaacson.
* T. R. Dumergue.

EDITING COMMITTEE.

Rev. T. A. Preston.
W. R. Carles.
R. F. Isaacson.

HONORARY MEMBERS.

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A. Armstrong, Esq.
H. M. Moule, Esq.
W. E. Mullins, Esq.
F. E. Thompson, Esq.
Rev. J. J. Pulleine.
Rev. J. F. Bright.
Rev. J. Sowerby.
H. C. G. Moule, Esq.

MEMBERS.

R. B. Mainwaring.
J. W. Parrington.
A. Marshall.
H. W. Hockin.
R. R. P. Hilton.
T. E. Maclean.
W. E. Bolland.
A. Herklots.
E. H. Carr.
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J. H. Johnson.
* F. J. H. Jenkinson.
A. C. Hilton.
C. E. Powell.
J. E. Hilliard.
W. D. Smith.
H. M. Hilton.
* G. H. Dawson.
E. im. Thurn.
E. Almack.
A. M. Hardy.
H. G. Baily.
J. C. Palmer.
F. W. Head.

* Heads of Sections.

RULES.

1.—That this Society be called the Marlborough College Natural History Society.

Constitution.

2.—That the Society consist of Members and Honorary Members.

Officers.

3.—That the Officers of the Society consist of a President, Secretary, Treasurer, and Librarian, to be elected from and by Members of the Society.

Management.

4.—That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, and three other Members of the Society, to be elected from and by Members of the Society; three of whom shall form a Quorum.

President.

5.—That in case of an equality of votes, the President shall have a double or casting vote.

6.—That in the absence of the President, the Committee be empowered to request any Member of the Society to take the chair.

Committee.

7.—That on the occurrence of any election, each member of the Committee have double the number of votes of any other Member of the Society.

8.—That two Members be appointed half-yearly by the Society, to assist the Secretary in Editing the Report.

Secretary.

9.—That the duties of the Secretary be to keep a list of all the Members of the Society, and of all former Members and Benefactors who may wish to receive the Reports of the Society; to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

10.—That in the absence of the Secretary from any meeting of the Society, minutes of the proceedings be taken by a member of the Committee, appointed by the President.

Treasurer.

11.—That the duties of the Treasurer be to collect all sums of money due to the Society; to receive all donations of money; and to disburse all sums payable by the Society out of the funds entrusted to him.

12.—That the Treasurer furnish half-yearly a detailed account of the receipts and disbursements to be audited by the Committee.

13.—That the funds of the Society be placed in the College Bank, and that no money be withdrawn by the Treasurer without the signature of the President to the order; or in his absence, that of the Secretary.

Librarian.

14.—That the duties of the Librarian be to keep a catalogue of the Library, with the names of the Donors; to see that the Library Regulations are carried into effect; to be responsible for the order of the Museum, and when necessary to assist the Secretary in the distribution of the Reports of the Society.

Library.

15.—That any Member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Committee, be allowed to be taken from the room.

16.—That if any Member wishes to take a volume from the Museum, he shall give his name, and the name of the book, to the Librarian, who shall enter them in the book kept for the purpose.

17.—That every volume so taken out be returned by the end of the quarter, but that no book be kept more than one month.

18.—That if any volume be damaged, such damage shall be reported by the Librarian to the Committee, who shall decide upon any further proceeding in the matter.

Museum.

19. That any Member of a section, who is not a Member of the Society, be allowed access to the Museum at such times as it is open to Members of the Society generally, provided he first obtain leave from the President, which leave shall be renewed every quarter, but may be taken away at any time, if the privileges be abused in any manner.

20.—That the same privileges be extended, under the same conditions, to to such other Members of the School who may wish to use the Library and Collections for the purposes of study, provided there be a reasonable excuse for their not belonging to a section.

21.—That in all cases the Museum be used for the study of Natural History alone, and not as an ordinary Reading Room.

Members.

22.—That the election of new Members rest entirely with the Committee.

23.—That every Member pay a half-yearly subscription of 2*s.* 6*d.*, to be paid at the first meeting of the Society in that half-year.

24.—That if a Member be elected at, or after the Quarter, he shall only pay 1*s*. on Election.

25.—That Members have the right to be present, to state their opinions, and to vote at all general meetings of the Society; to introduce a visitor at general meetings of the Society; to have personal access to, and to introduce a visitor to the Museum; and to have a copy of the Report half-yearly

Visitors.

26.—That on such occasions when the number of those who wish to be present as visitors at the general meetings of the Society is greater than the number of members who attend, the President and Committee shall be empowered to admit two or more each, as shall seem fit.

Honorary Members

27.—That Honorary Members have all the privileges of Members, except the power of introducing a member of the School to the meetings of the Society.

Suspension of Members.

28.—That any Member be liable to be excluded from the Society by the Committee, if, in their opinion, he shall have failed to show sufficient energy in the working of the Society.

Sections.

29.—That sections be formed for the more accurate study of the different branches of Natural History, and that the heads of these sections be chosen by the Committee half-yearly from Members of the Society.

30.—That these sections shall hold meetings as often as shall seem fit to the heads of the several sections, at which any member of the school, with the sanction of the head of that section may attend.

Meetings.

31.—That ordinary meetings of the Society be held once a fortnight, but that the Secretary be empowered to call extraordinary meetings when necessary.

New Rules.

32.—That any Member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

MEETING HELD AUGUST 24TH, 1866.

This being the first meeting held in the new Museum, a vote of thanks was passed to the Master and Council, for their kindness in fitting up the room for the Society's purposes.

Entomology.

THE PRESIDENT exhibited two boxes of moths, presented by A. Marshall and A. C. Hilton to the College collection.

A. C. ALMACK exhibited a living specimen of *Acrida Viridissima,* a large species of grasshopper.

J. W. PARRINGTON exhibited a specimen of the Musk Beetle, one of the Long horns, captured that day.

G. K. MILLS exhibited Larvæ of the Puss Moth *(C. Vinula)* and Poplar Hawk *(S. Populi).*

Geology.

C. A. HARRISON exhibited specimens of wood from a submarine forest at Hartlepool.

W. E. BOLLAND exhibited a fossilized nest and eggs.

T. W. MOORE exhibited a piece of the Atlantic cable of 1865.

After the general meeting W. R. Carles was elected to the Committee, *vice* F. C. Lightfoot, and to the office of secretary, *vice* W. W. Dayman, resigned; and R. F. Isaacson to the editing committee. A vote of thanks to W. W. Dayman was carried unanimously.

There were 39 persons present.

MEETING HELD SEPTEMBER 7TH, 1866.

Botany.

THE PRESIDENT passed round a list of the Botanical notices for the past fortnight. Among these were notices of 7 plants, and upwards of 30 localities, hitherto unrecorded. He then passed round a specimen of the common garden Nasturtium *(Tropœolum),* in which several stalks had adhered together. Also specimens of the following esculent Fungi: *Agaricus Fusipes, Clavaria, Coralloides* and *Cantharellus Cibarius, (Chantarelle.)*

Ornithology.

A. C. Almack made a few remarks on the ornithological notices obtained during the past fortnight, mentioning particularly the finding of a nest of the Yellow-hammer; he also exhibited a stuffed specimen of the Night-jar, and made some remarks on its habits. He then read a short notice respecting the Cuckoo, and asked for facts to prove or disprove the statement that the bird has the power of colouring its eggs, to suit the colour of those of the bird into whose nest it drops them.

Geology.

C. A. Harrison passed round specimens of *Turrilites Costatus*, *Inoceramus Lamarckii*, *Ammonites varia*, and *Inoceramus Mytiloides*, obtained from the lower chalk beds, at Bignall, near Swindon; he also passed round a figure of the Turrilite, to give an idea of its shell; also a bull's horn, and a piece of charred wood, brought from Moscow by Dr. Fergus, which had been burnt in the fire in 1812, and dug up from a depth of 30 inches below the surface of the ground.

Entomology.

W. W. Dayman read a list of notices obtained during the past fortnight, among which were the Kitten Moth *(C. furcula)*, the Purple Hair-streak *(T. Quercus)*, *L. Testacea*, &c., all of which were species new to the College List, and remarked upon the unusual number of larvæ of the Sphinges found this season. He then exhibited the new species, as well as a box of insects, forming part of his donation to the College collection.

T. E. Maclean exhibited three specimens of the Diamond beetle.

H. M. Hilton exhibited a specimen of a locust taken in Kent.

A. C. Almack then read the following paper on the

SONG OF BIRDS.

The first question that naturally arises in the mind of anyone reflecting on the song of birds is whether it is innate or acquired. The opinions of naturalists on this point vary very much, and I will try to put before you now the principal arguments used on both sides.

First, it is true that birds in confinement will learn the song of others with which they are constantly kept. Such is very frequently the case with the canary, but before this can be taken as a proof that song is innate, it ought to be shown to be always or almost always the case. Again, it is objected to this argument that the song is never purely that of the bird imitated, but always retains traces of the natural song of its own species. Many persons contend that though this may be the case, yet the very fact of another bird's song being acquired and habitually sung is sufficient to show that song is not absolutely innate.

Another argument used by Colonel Montagu in his Dictionary is that, if birds naturally acquired the songs they hear, the young of birds would constantly be acquiring that of some species which has its nest in the same bush or somewhere near. Of course this argument is strong, but not so conclusive, I think, as Colonel Montagu seems to regard it. For though it is by no means a rare occurrence to find nests of the same and different species close together, yet we must not forget that birds do not generally sing in the bush where their nest is, but at some distance from it. And again it is little to the point, when we consider that, after the young birds reach an age when they would be likely to begin to sing, the parent birds are in most species quite silent.

Of course we are tempted to think of our own case, and try to reason from the fact that we acquire any language and are not born with it. But the fallacy of resting for a single moment on this reasoning will appear when we consider that people talking all languages do not reside in the same place in great numbers as birds which, though they sing different songs, still inhabit the same wood. Here, then, will come in the great question, whether birds distinguish members of their own species by sight or by the voice. Many persons think that it is by the voice, because there are species so exactly similar to one another that they cannot be distinguished outwardly. For my own part I cannot see why these two should be the only means they have of discerning members of their own species; but am inclined to think that they are endowed with some instinctive power which enables them to do it, and also that their song is innate, and may be changed to that of other birds which they hear in a state of domestication, when birds as well as all animals can hardly be said to be subject to the same laws as when in a state of nature.

Having dismissed this question, let us now proceed to consider how the song of birds is produced, and why the voice is proportionally so much greater in them than in almost any other creatures. At the base of the windpipe are two tubes called the bronchial tubes, which lead into the lungs. At the entrance to these tubes are two bronchial muscles, by the movement of which, as they contract and expand, the modulations of the voice are made. The beak acts merely as the air-holes of a flute, the muscles and the windpipe being the real musical organs. The windpipe is less required for breathing in their case than in that of any other creatures, in consequence of the general diffusion of air-cells and breathing tubes over the whole frame.

I shall now proceed to make a few remarks on the causes of song among birds. The generally received opinion seems to be that it is caused by the stimulus of love. The ground for this view consists in the fact that the song is stronger and much more constant at the time of incubation than at any other time. Such is certainly the case with very many of our summer visitants, such as the nightingale, the blackcap, and others. Most of these birds, too, it has been noticed, use their song as a means of attracting the female, to attract whom they perch themselves on some high bough and pour forth all their melodious powers, which fact certainly does seem to point to the song being caused by love. No sooner does the nightingale make its appearance (which the male does invariably before the female), than it begins its powerful song seated on some conspicuous branch, though at other times so timid and retiring a bird. Colonel Montagu states that after the female has begun her nest the male sings very little till after the first brood are hatched and fledged, when he again pours forth his melody. In the mean time he is busy helping the female, in some cases helping to build the nest and hatch the eggs, and almost always helping to feed the young. All these facts are hardly to be doubted when announced by such an authority as Montagu, but yet I cannot help venturing to remark, that either there must occasionally be more nightingales about us than we think, or else that the song must be continued longer than is necessary to attract the notice of the gentler sex. Of course I only mention the nightingale as the type of our visitant songsters.

Against this theory that song is merely stimulated by love there are many almost overwhelming arguments. There is the natural one that caged birds sing all the summer through, which may be met in two ways, viz., that caged birds can hardly be expected to act as if in a state of nature, and in a much more satisfactory way, by showing that birds even in a wild state may be forced to continue their song beyond their natural time. An experiment was once tried of separating a Redstart from its mate. The cock bird immediately began his vociferous calls, which he had not employed while the female had been sitting on her nest, and a new mate was soon attracted and a brood reared. The same experiment was tried with a nightingale, attended by the same result. Here again we see from these experiments a very strong corroboration of the above theory. But yet we must remember that our remarks have only extended over the period of the year when breeding goes on. That birds only sing at this time is a very erroneous supposition, as the following table (drawn up from personal experience by a gentleman living near Dublin) will show:—

Out of 41 songsters	16	...	...	... ...	sing in	January.
„	25	...	...	... ...	„	February,
„	32	(including	2	summer visitants)	„	March.
„	37	„	7	„	„	April.
„	39	„	8	„	„	May.
„	38	„	9	„	„	June.
„	18	„	8	„	„	July.
„	14	„	3	„	„	August.
„	8	„	3	„	„	September.
„	9	„	1	„	„	October.
„	10	...	...	... ...	„	November.
„	11	...	...	... ...	„	December.

Tables of this sort are of the utmost use, but they ought to be made in many places to obtain any real idea of the general numbers throughout the country, and it would be very valuable to us could we draw up one for Wiltshire. The one given above, however, conveys a fair idea of the number of songsters we have per month, our whole number being about 50.

Now the Robin sings all the year round in the most indefatigable manner, except for about six weeks in the height of summer. His song generally commences about the first week in August and goes on till the following June, and may constantly be heard, as we all know, in the frosty month of December. The Wren, too, is an early winter songster, first singing in November; the Wagtail is another, though he does not begin so early or sing so frequently. According to a list I have found given by a gentleman living at Esher, in Surrey, the song begins in January and lasts till July. The Common Thrush, too, is a very constant singer, and may often be heard singing on fine days in the winter. Last year we had a notice recorded of one singing on November 19. I have notices besides of their song being heard on Jan. 10, and Feb. 2. Besides these birds there are several others whose song is often heard in the autumn and winter months, viz., the Skylark, which may be heard in January and the autumn months, the Missel Thrush, Blackbird, Hedge Sparrow, and Chaffinch, which sing in October and September, and begin their spring song as early as February.

"That the song of birds is the language of love," stated by a naturalist in the *Zoologist*, "and as such only to be heard during the pairing season, is an old theory, but not the less incorrect for its age," has, I think, been shown by the facts above quoted, for out of the many species we find singing after July, but three or four build second nests, and we know ourselves how rarely we find a nest after that month. Last year and this we have had very late notices of the Yellow-hammer's nest, one on the 3rd of September and the other in August, but these are the only two we have. I believe myself that song is mainly, if not entirely, dependent on a joyousness and lightness of spirit, whether produced by genial weather, abundance of food, love, or any other cause, and, in fact, that a bird sings under the influence of the same natural impulse as that which causes the yelping of the playful puppy, or the whistle of the idle school-boy. Witness birds in confinement: supply them with sufficiency of warmth and light, and you may have them singing at any period of the year, and by day or night; the thrush singing as clearly and sweetly by the glare of the gas lamp as in the bright sunshine.

Of course there is an objection to this solution of the question, viz., why, if such is the case, does the song ever stop altogether for a considerable time, as there are fine sunny days in all months of the year. What are the reasons for these songless periods we can hardly hope to determine, as we cannot even form a probable guess on the subject, if we set aside the supposition that song is caused by love, which I think we have abundant reason for doing from what has been said above.

Let me now give you a comparative table of the songs of ten of our commonest English songsters. Perfection being represented by 20, we find them marked as follows :—

	Mellowness of tone.	Sprightliness.	Plaintiveness.	Variety of notes.	Degrees of compass and execution.
1. Nightingale.........	15	12	20	16	20
2. Song Thrush	8	9	10	11	12
3. Blackbird	6	2	10	6	10
4. Skylark	4	12	3	10	10
5. Blackcap	10	14	2	8	9
6. Woodlark	16	2	7	6	9
7. Titlark	7	6	1	5	7
8. Robin	4	10	11	8	10
9. Garden Warbler...	5	7	4	6	8
10. Missel Thrush......	4	6	3	4	6

Many persons of course would disagree with this order of our songsters, and would put the Blackcap earlier, but no one can doubt that the Thrush is fully entitled to stand second to the Nightingale, if he does not even dispute the first place with him, which I am inclined to think he would do were he such a rarity as the Nightingale.

Let me now say a few words on each of these ten songsters, confining myself more especially to their singing powers and habits.

The *Nightingale* must of course come first. It owes its name to its habit of singing in the night, *gale* being a corruption of the Saxon word *galau*, to sing. It makes its appearance in England about the latter end of April or the beginning of May, according to the mildness of the season; and the males invariably arrive ten or fourteen days before the females. One of the most remarkable facts about this bird is the curious circuit it makes in its migration to this island. Very rarely indeed is its song heard north of Yorkshire or west of Devon and Dorset. They seem to be most numerous in Hampshire and Kent, and the counties round the metropolis. Much has been said on this subject, and it has been conjectured that some minute insects on which it feeds must be the cause of its partiality for those counties. This bird expresses his different emotions by suitable and expressive tones. The most unmeaning cry, and one which he utters when alone, appears to be a simple whistle. In anger, jealousy, rivalry, or any extraordinary event, he can utter a very hoarse and disagreeable sound, like that of a jay or a cat. The strength of his vocal organ is indeed wonderful; but it is not so much the strength as the compass, flexibility, variety, and harmony of his voice which make it so admired by all lovers of the beautiful in sound. At times dwelling for minutes on a strain of only two or three melancholy notes, he begins in a subdued voice, and then gradually swelling out to the highest point of strength, ends it by a gradually dying cadence. It sings most beautifully on its first arrival, but only continues in song for three months at the most. The song of the female is similar to that of the male, though not so powerful. It may be heard at almost any time on a calm night, though some naturalists have stated that they are silent at a certain time. The shutting of a neighbouring gate, the striking of a church clock, the passing of a cart, or even the footsteps of passengers walking on a hard turnpike road, will frequently cause it to commence singing: incidents which one would suppose would rather disturb so shy a bird. He chooses two or three trees not too near his nest, for fear of its being discovered, on one or other of which he sits and sings constantly, never allowing one of his own species to approach the nest. The bird is said to sing as sweetly in confinement as in a state of freedom, and I have found an account of one that sang with all its natural power and sweetness in a dark cellar in the High Street of Edinburgh, where no light was admitted but what came through the open door: the atmosphere was charged with the fumes of tobacco and spirits: it was a place where carriers lodged or put up, and the heads of the porters nearly came in contact with its cage, which hung at the foot of the staircase.

Of the *Song Thrush*, which comes next, I need hardly say anything, as its habits must be known to most persons present. It is very fond of singing from about three in the afternoon till sunset, perched on the top of some high tree. The seasons at which it sings I have stated above.

The next on our list is the *Blackbird*, whose song commences early in the spring, and is a shrill kind of whistle of various notes, most brilliant in the sunshiny intervals between showers in May. The following is a very curious anecdote relating to the vocal powers of this bird:—One that was kept near a farm house acquired the power of imitating the crowing of a cock, which it used to do to such perfection that all the cocks within hearing would answer it.

We now come to that universal favourite the *Skylark*. We all know its song well. No other bird sings on the wing to anything like the same extent. Very few birds sing at all then; but the Skylark does so always. As it mounts upwards it pursues a spiral course, gradually enlarging the circles; its flight, too, is by no means smooth and regular, but performed by a succession ef leaps. The accordance of the song with the mode of the ascent and descent is also worthy of notice. When the volutions of the spiral are narrow and the bird is changing its attitude rapidly the song is partially suppressed, and swells as the spiral flight widens, sinking again as it contracts, so that, though the notes may be the same, it is only when the lark is poised at the same height that it sings in an uniform key. Its song swells as it ascends and sinks as it descends, and even if it takes but one wheel in the air, as that wheel always includes either an ascent or descent, it varies the pitch of the song. It sings from February to October.

The *Blackcap* arrives about the beginning of April, and continues singing from that time to about the middle of July. It is very fond of gardens, and its song is little inferior to that of the Nightingale in many persons' opinion, though possessing less variety. The bird generally sings seated on a high branch, with its head much elevated. In trilling it excels all songsters, and in the swells and cadences of the trill, the throat experiences very strong convulsions, and the whole bird appears excited.

Next is the *Woodlark*, whose song is almost unequalled in mellowness, and excels that of the Skylark in richness of tone. It occasionally sings on a tree, near which it loves to take up its quarters. Its style of song is altogether much like that of the Skylark, and, according to White, continues from January till September.

The *Titlark* is a merry little bird singing from May to the end of July. Its song is between that of the Skylark and Woodlark, without the power and variety of either. It is the same bird as the Meadow Pipit.

About the *Robin* no more need be said.

The *Garden Warbler*, as its name indicates, inhabits the same places as the Blackcap, for which it is often mistaken, as the eggs and nest are almost precisely similar. It arrives like most of the others about the end of April, or beginning of May. Its song consists of some notes sweetly and softly drawn, while others are quick, lively, loud, and piercing, and it has a whistle something like that of the Blackbird. It is the same as the Fauvette and greater Petty-chaps.

Last comes the *Missel Thrush*, which is the largest songster we have. He sings generally during a storm, or in a lull just after it.

There are many other singing birds, though of minor importance, such as the Linnet, Wren, Goldfinch, Chaffinch, and others, but I have omitted them, as they would make my paper too long, and, perhaps, too dry.

The following letter connected with the above subject appeared in the *Marlburian* of Sept. 26:—

"SIR,—May I ask for a few lines' space to say a word or two on the singing of birds, and especially on the Cuckoo's note? These remarks were intended to be made at the last meeting of the Natural History Society, but press of other subjects made it necessary to omit them.

On the singing of birds in general, it is worth remarking, that no connexion whatever exists between it and our own human, artificially modulated, music. To be fond of Beethoven or Mozart is not necessarily to care for the *avium concentus in agris*, nor *vice versa*. It took many centuries to evolve some of the simplest, and now most familiar, combinations of our modern harmony. In birds' songs there is no harmony in the ordinary sense, and very little of what the musical composer knows as melody.

Of the Cuckoo in particular, it has not perhaps been often remarked that its note is *always* a musical *third*. This forms an exception to the general character of birds' songs; I believe that, excepting in the case of young birds, the cuckoo never "sings his name to the hills," in an interval so large as "a minor fourth," or so small as a "whole single tone." In other words, he always sings in a major or a minor *third*. Observe that the third is *major* as well as minor. This contradicts a whimsical theory which is sometimes laid down, that *all* natural sounds (wind whistling, water rippling and plashing, birds singing) are modulated in minor intervals. So far as there is modulation at all, it is purely accidental, and leads to major quite as often as to minor intervals.

Your obedient servant,

H. M. M."

After the paper the Society proceeded to pass some new rules submitted to them by the Committee.

There were 43 persons present.

MEETING HELD SEPTEMBER 10TH.

This was an extraordinary meeting, called to complete the passing of some new rules, submitted to the Society by the Committee.

MEETING HELD SEPTEMBER 21ST.

In the absence of the President, the chair was taken by H. M. Moule, Esq., who read letters from Professor Owen, Professor Newton, and the Rev. C. Pritchard, exhibiting warm interest in the Society.

Geology.

W. D. SMITH exhibited *Cardium dissimile*, *Trigonia incurva*, *Ammonites varians*, and *Ostrea*, from the Portland Beds at Swindon.

Botany.

In the absence of the President there was no report.

W. W. DAYMAN exhibited specimens of the Lady's Tresses (*Neottia spiralis*), found near Martinsell.

Ornithology.

A. C. Almack exhibited specimens of the Snow Bunting, in winter plumage, and of the male and female Night-Jar.

E. im Thurn exhibited a skin of the Green Woodpecker.

Zoology.

H. W. Hockin exhibited the fins of the Flying Fish (*Exocetus volitans*).

Entomology.

W. W. Dayman read out a list of captures made during the past fortnight, and passed round two boxes of Moths, presented to the Society's collection by the Rev. J. Greene.

Archæology.

H. M. Moule, Esq. exhibited a £5 piece, coined in the reign of George III.

T. W. Dumergue exhibited a box of coins.

The Librarian then passed round some books which had been presented to the Society. These were "Ootheca Wolleyana," Part 1, presented by the author; "Cassell's Birds," by A. Herklots; and "The Entomologist's Monthly Magazine," by the Rev. T. A. Preston.

G. K. Mills then read the following paper on

THE ICHNEUMON FLY.

"Big fleas have little fleas
Upon their backs to bite 'em,
And little fleas have lesser fleas,
And so *ad infinitum.*"

The subject which I propose to speak about this evening is one which doubtless has more interest for the Entomological portion of our Society, yet I think the rest of you may be interested to hear a few facts relating to the habits and life of these insects, which exercise so large an influence over the Entomological world. I was induced to choose this as the subject of my paper chiefly by the fact that for many years my tender hopes of a fine Poplar Hawk or Puss Moth have been so very frequently blighted by the appearance of one or more fine Ichneumons from the Chrysalides, of which I was so proud, and which I had watched so carefully. I remember three years ago being greatly disgusted at the large amount of these insects which I unwittingly reared, principally from Puss-moth Chrysalides, so I naturally wanted to find out something about my enemies, and the result of my investigations I now venture to read before you, hoping you may benefit by my sad experience.

The name of Ichneumon has been given to these insects from the similarity of their habits to those falsely attributed to the quadruped of that name, namely, that of depositing its young in the body of the crocodile, the entrails of which are by degrees devoured by the parasite. Other old authors have named these insects *Muscæ triplices*, from the shape of the ovipositor; while others called them *Muscæ vibrantes*, from the constant vibration of their antennæ, which enables them in some manner to acquire a knowledge of their food, and of the objects fitted for the reception of their eggs. These insects are of vast importance in the economy of nature, by preventing the too great increase of different species of insects, especially of the caterpillars of butterflies and moths, of which they destroy a great number, it having been observed that a superabundance of any species of insect is attended by an increased production of its parasitic enemies.

The shape of an Ichneumon is something like that of a wasp, only much thinner; but its chief characteristic is its *ovipositor*. This instrument is at the extremity of the abdomen, and is contained within two pairs of demi-sheaths. It is called the *terebra*, or borer, and is itself formed of three parts, by the union of which a passage is formed for the protrusion of the egg. In the act of oviposition the *terebra* is bent beneath the body of the insect, which then works itself from side to side, giving the ovipositor a kind of saw-like movement. There is scarcely a tribe of insects which is not attacked by one or other species of this tribe. When the Ichneumon sees a caterpillar which it thinks will be a suitable home for its young. it alights on it, and inserts its ovipositor into its flesh, and, in spite of all the efforts of its victim, does not desist till it has deposited an egg there, and secured subsistence for one of its future progeny. Sometimes she finds out by instinct that some other Ichneumon has forestalled her; then, as if aware that the same caterpillar will not suffice for the support of two, she leaves it and searches for another. In the case, however, of some very minute species of Ichneumon, as many as 150 can subsist in a single caterpillar. It is not, however, only caterpillars that they attack, for they reach the *spider* in his web, they discover the hole of the *carpenter bee*, and though they cannot enter the cell, they introduce their long ovipositor, and deposit an egg in the helpless grub; they kill the *weevil's* young in a similar way, and so are a perfect god-send to the farmer; they can pierce through the *galls*, and give the hapless insect within a young friend to take care of; and lastly the *wire-worm* often falls a victim to their marvellous instinct. The larvæ hatched from the eggs thus deposited find their food in the body of the caterpillar or grub; but the wondrous instinct of these larvæ makes them carefully avoid touching the *vital organs* of the creature they inhabit, and live only upon the fatty matter, until they attain their full size, and are ready to assume the pupa state, as if they were aware that their own existence depends on that of the insect on which they prey. Thus the caterpillar continues to the last to eat and live and move, apparently little injured, and only perishes when the grub inside no longer requires its aid. When these larvæ are ready to become pupæ they pierce the skin of the caterpillar, spin cocoons beneath its body, and then turn. In some cases, however, they use the skin of the dead insect as a cocoon. Then in a short time the pupa of the caterpillar discloses not a moth or butterfly, but one or more full-grown Ichneumons.

The perfect insects are found flying amongst trees and plants, and especially among the heads of flowers, from which they get the honey on which they live. Some species are found on trunks of trees and stumps of wood, evidently searching for larvæ wherein to deposit their eggs, as this is all the object of the Ichneumon's life, while those which have short ovipositors seek such larvæ as have no domicile, for the same object. When taken in the fingers they immediately attempt to sting, causing a slight irritation for the moment, but so trifling that it is evident they can emit no very powerful poison.

Some Ichneumons glue their eggs to the skin of their prey instead of burying them in its body. One kind places its eggs on the larva of a large bettle, upon which, when hatched, the young maggot feeds by introducing about half its body into its victim, so that it is half in and half out. Another tribe, imitating the cuckoo, contrive to introduce their eggs into the nests of bees and other insects; they therefore are constantly on the watch, and the moment the unsuspecting mother leaves her cell to get food or materials, they glide in and leave an egg to assassinate the larva by its side.

In fact there is scarcely an insect in the world which, in its larva state, is not exposed to the attacks of one or other of the Ichneumon species; even their eggs are not safe. I have also found it asserted that they deposit their eggs in the body of the winged grasshopper, the interior of which is at length eaten up by their larvæ, and at the proper season, hundreds of grasshoppers in this condition may be found with just strength enough remaining to flutter to a tree or fence, and with a dying effort to fix their hooked feet so firmly as as to retain their position long after death.

Hitherto no species of this family has been observed which is not parasitical; though some doubtful instances are brought to prove the contrary, their evidence is hardly conclusive.

The developement of these parasites within the bodies of other insects was for a long time a subject of much speculation amongst the earlier philosophers, who conceived it possible that one animal had occasionally the power of being absolutely transformed into another. One writer on this subject calls it "a thing very wonderful that 545 flies of the same species were produced from four Chrysalides of a butterfly, so that the life and motion of these seem to have *transmigrated* into those of the 545 others."

The larvæ of these insects are destitute of feet, having a soft, white, fleshy, and nearly round body, with fleshy tubercles on the sides. They generally do not destroy their victim in the larva state, but allow it to become a pupa, in the body of which they turn, and do not appear till they are perfect insects.

The larvæ of the majority spin a silken cocoon, in which they pass their pupa state; these cocoons are sometimes found in a mass together, and are often enveloped in a general covering of yellow or white glossy silk, forming a large oval mass, which may be often seen on railings, walls, plants, &c., and in one species the cocoons are arranged in a symmetrical manner, like the cells of a miniature beehive, without any outside covering. Other cocoons are found suspended to leaves or twigs by threads, sometimes three or four inches long, and others again turn to pupæ in the hardened skin of the Aphis, (such as "the blight" of the rose, &c.) when they have eaten the interior. Linnæus says that there are 77 species of Ichneumon, but I find that Stephens gives the number as "several hundreds," shewing the large number which have been discovered since Linnæus' time.

The English specimens are as a rule not more than an inch long, and generally less, but one exotic species is found three or four inches in length.

The thing that seems to be most worthy of notice in this interesting family is the parental instinct of the Ichneumon, shewn in providing a safe home for its eggs. How perfectly wonderful is the power they have, first of finding their prey, then of forcing it to nourish their young larvæ, till it at last falls a victim to their continued ravages. As a curious parallel I may mention here the way the gad-fly, though it does not belong to this family, provides for her eggs. Its larvæ have to live in the stomach of the horse. How is she to get them there? Well, she flies round the animal, and poises her body while she glues a single egg to one of its hairs, then repeats the process till she has fixed many hundred eggs. These in a few days hatch into little grubs. Whenever, therefore, the horse licks any part of his body where they are, they stick to his tongue, and so pass into his mouth, and thence to his stomach. But you may say, "The horse can only reach a small part of his body with his tongue, what becomes of the other eggs?" The gadfly places her eggs only on those parts which the horse can lick, confining them in fact almost exclusively to the knee or shoulder, which he is sure to lick. Does not this almost cast into the shade the boasted reason of man?

There were 44 persons present.

MEETING HELD OCTOBER 5TH.

Geology.

C. A. **Harrison** gave a Report of the proceedings of the Section during the past fortnight, and exhibited some Saurian remains from Portland Island, and *Cerithium Portlandicum*, found at Swindon.

W. R. Carles exhibited a horse's tooth and some pieces of iron, found under a stone of 30 tons weight near the "Devil's Den," kindly lent by Mr. Neate.

T. E. Maclean exhibited a shell coated with sand, by the action of salt water on iron.

Entomology.

W. W. Dayman read a Report mentioning the discovery of five species new to the College list, and exhibited the most interesting species captured, among which were the following :—*Ennomos Tiliaria, Epione Apiciaria, Anthocelis lunosa, Phibalapteryx lignata, Pterophorus plagiodactylus*, &c.

C. E. Powell exhibited the larva of the Death's Head moth *(A. Atropos)*.

A. Marshall exhibited specimens of the hornet, wasp, and *Sirex gigas*, the latter, an insect in its larva state very injurious to fir-trees.

The President exhibited a specimen of *Stenepteryx hirundinis*, a parasite of the swallow, remarkable for its large size, which is such that two or three are sufficient to cause the death of the bird; found by the Rev. A. G. Bleeck.

Ornithology.

G. H. Dawson read a report, and exhibited a specimen of the Kingfisher.

Botany.

The President exhibited specimens of *Geaster fimbriatus*, a rare fungus, found by A. R. Wiggin in the Forest; also of *Spumaria mucilago*, a fungus unusually abundant this year; slices of Yew and Ash, aged respectively 117 and 51 years; also a specimen of Mistletoe on Apple, to shew the damage caused by the Parasite.

Mineralogy.

The President exhibited a large specimen of Malachite.

Zoology.

The President exhibited a young turtle from St. Helena.

W. W. Dayman then read the following paper on

ANTS.

In the present century when every form of government is being canvassed, it would be refreshing to a statesman to turn his eyes to a spot in the world of nature, which could gladden him with the sight of one form of administration in which all is harmony and concord, one, too, subject to no revolutions, and in which, each individual has a due influence on the welfare of the commonwealth, and which, therefore, we may say has discovered the golden mean of social happiness. Let such an one pause for one moment to reflect on the economy of an Anthill, ere he passes it heedlessly by, and he will see that ideal form of government I have described, developed in the shape of a constitutional monarchy. Well therefore may Kirby and Spence class ants among their "Perfect societies of Insects," although by this term they mean to denote, merely that they are one of those societies who continue to live together throughout their whole existence, as opposed to imperfect societies, such as those of the caterpillars of the *Procession Moth*, of *Whirligig Beetles*, so often visible on the surface of ponds, of *gnats*, and others, which to quote the words of Mr. Kirby "are either associated during part of their existence only, or else do not dwell in a common habitation, nor unite their labours to promote a common object."

In treating of ants and their habits, we must speak first of the ants themselves, and mention the various classes or sexes, for these terms are synonymous in ant life, as also in the case of bees. There are then three sexes, viz., males, females, and neuters or Workers. Of these, the two former merely serve the purpose of continuing the species, the whole duty of the structure, defence, provision, &c., of the state, devolves upon the *neuters*, *workers*, or 3rd class. In some species the *workers*, are subdivided into other classes, and, in the case of a Mexican species, while some of the workers are of the usual form, others have their bodies greatly enlarged for the apparent purpose of keeping up a constant supply of honey, the use of which has not as yet been discovered. The average, and indeed by far the greater number of species, follow the above classification, viz., males, females, and workers or neuters.

Many of you must have noticed, at this season of the year, vast swarms of winged black ants, rising and falling in the air, which are precisely like imperfect societies of gnats, and are composed entirely of males and females. On the termination of this flight the males die immediately, sometimes covering paths or streams to such an immense distance that, in one instance, they covered a space from 5 to 6 miles long, with a heap 6 inches high, and eight or ten feet broad. The females do not long survive them; with the exception of a few which are still kept in the anthill for the purpose of laying eggs and preventing the society from dying out.

These females thus detained become Queens, much in the same way as the female wasps, and while detained are treated with the utmost kindness and attention by the workers, who however take good care that they shall never leave the nest. For this purpose a single sentinel is posted to watch the Queen, who takes up his position with his hind legs on her body, and his forelegs on the ground, and in this position he remains, until relieved by another. But no sooner has the queen finished oviposition, than the ants crowd round her and pay her the most attentive homage, feeding her, caressing her, and even carrying her about on their antennæ, in short treating her as a beloved sovereign, and rivalling the bees in their respect for royalty.

Such are the comparatively uninteresting annals of the lives of the males and females, the two first sexes or classes, comparatively uninteresting

I say, because it is the 3rd class or workers, who exhibit the most striking instances of sagacity and foresight, and therefore to them I shall devote the remainder of my paper.

This class forms by far the largest portion of the anthill, and on them devolve the duties of rearing the young, building the anthill, carrying on offensive and defensive operations against their neighbours, and managing all the internal economy of their commonwealth. They possess a language the expression of which is supposed to reside in their antennæ, which they move with marvellous quickness: and which they use also for feeling their way, testing wholesome or unwholesome food, recognizing a friend or an enemy, and generally for communicating their feelings and desires.

And now let me speak of the wars of the ants. These generally take place between nests of different species, but in some instances war has been seen to be carried on between ants of the same race: indeed in the case of one species intestine revolutions occur, and the minority then form a feast for the majority. When an ant attacks another, he does so in the following way: raising himself on his last pair of legs, he bends his abdomen between them, seizes his opponent with his jaws, and injects into the wound thus caused a venomous fluid, called Formic Acid, (which is much used in physic).

Besides these wars, they actually make "razzias" on other nests, for the sole purpose of obtaining slaves—the only instance yet discovered in Nature, where one species makes another his servant. This astounding fact might well appear a fiction, were it not attested by M. Hubner, who has made Ants and Bees his especial study, and has cast more light on their habits than any other naturalist, before or since. He affirms that the Red Ants make forays into the nest of the Black Ant, (who are mere pigmies compared with their invaders), and generally contrive to carry off a pupa of the black species a-piece. These they rear in their own nest to be "hewers of wood and drawers of water." Sometimes, though very rarely, it happens that the Black Ants manage to defeat and drive away their enemies, by their numerical superiority.

No less striking, again, are their habits in peace. In the early part of April, when the sun is shining warm and bright, they may be seen basking in huge masses on the outside of the ant-hill, or playing with one another, and carrying one another about on their antennæ.

Ants frequently make migrations from their old nest to some more suitable spot, and on these occasions they act in the following manner. The finder of the new locality returns to the parent nest, and picks up a friend on his antennæ, and carries him off to the new spot: here he drops him, and the ant, thus unceremoniously treated, himself joins the other as recruiting sergeant. This process is repeated, until a sufficient number are collected to form a new nest.

Perhaps, however, the most extraordinary trait of ant character is their appearing on the stage as a pastoral people, whose flocks are kept solely for the milk, or rather its equivalent, which they afford. Everyone is, I think, acquainted with the little green Aphides, technically termed "blight" by gardeners and farmers. These are the "cows" of the ants, and the process of milking them is as follows—The ant goes up to one of these Aphides, and proceeds to pat it on each side alternately with its antennæ: this causes the Aphis to emit a drop of sweet sap derived from the plant juices it has imbibed which the Ant sucks in. Astonishing as this may appear, yet it has frequently been observed; moreover, the Ants guard these Aphides most carefully, and even in some cases convey them to their nests, and keep them close at hand. Nor are these Aphides the only cows they possess: it is a fact well known to all collectors of Beetles that an Ant's nest is a rendezvous for many species rare elsewhere, and a prolific field for investigation: it is more than probable that these beetles are kept entirely for this purpose by the Ants, who never will suffer stranger insects to intrude into their formicaries.

A mistake has originated with the ancient poets, and has been continued down almost to our own time: I mean the mistake of supposing that Ants lay up a store of food in the summer as a provision against the winter: and the Ant has been commended in consequence by Virgil in the well-known lines in the IV. Æneid. This mistake is caused by persons seeing Ants hauling along straws, &c., &c., to their nests; but these are only for immediate use, and not laid up as a store. Yet Ants, even if they do not attain to this pitch of foresight, might well share the palm of industry with Bees, whom they closely resemble in their habits and general government.

Ants have been the subject of no few strange stories. Herodotus, for instance, tells us of Ants which, though not so large as dogs, were yet larger than foxes, and lived in a desert, the sand of which contained a great quantity of gold, and which sand they threw up in making their ant-hills. This sand, he says, is much prized by the natives, who have recourse to the following means in order to obtain it. Each man yokes together three camels, two males on the outside, and a female (who has been separated from her young for the purpose) in the middle. He then mounts on the female and sets off to the place, taking care to arrive in the morning, as owing to the intensity of the heat at that time all the Ants are underground. Here he dismounts, and after filling two bags as rapidly as he can with sand, rides away immediately, for the Ants at once rush out and give chase. The female camel remembering her young one rushes off without ever flagging; but the males cannot go so fast, and are let loose in order to sate the fury of the ants, while the man escapes.

Another fable, current among the Mahometans, is that when all creatures were bringing their presents to Solomon, the ant dragged a locust to the foot of his throne, and was preferred to the other animals, as having brought something so much larger than itself.

Lastly, perhaps the most curious fable is that Ants when making their roads use their Formic Acid for the same purpose as Hannibal did vinegar. Both stories probably contain an equal amount of truth.

T. R. Dumergue and C. A. Harrison were elected to the Committee in the place of G. K. Mills and W. W. Dayman; and R. F. Isaacson Librarian in place of A. C. Almack.

A vote of thanks was passed to A. C. Almack, W. W. Dayman, and G. K. Mills, on leaving the School, for their services to the Society.

There were 38 persons present.

MEETING HELD OCTOBER 19TH.

Entomology.

F. J. H. Jenkinson gave a Report of the proceedings of the Section.

Geology.

A Report was read by C. A. Harrison, who exhibited some fossils collected by D. Soames, among which was a specimen of *Ammonites Splendidus*.

The President exhibited some volcanic dust, from an island which appeared for a short time in the Mediterranean.

Ornithology.

G. H. Dawson gave a Report, mentioning particularly the appearance of a flock of Crossbills, about 12 in number, which had been seen in the neighbourhood of Martinsell by J. W. Parrington.

Zoology.

A. Marshall exhibited two Tiger's claws.

W. R. Carles exhibited a molar tooth of an Elephant.

The President exhibited a specimen of the Common Bat, and also a large snail-shell, (a species of *Helix*), from Surinam.

Archæology.

The President exhibited an imitation Egyptian god, purchased near the Great Pyramid, and a household god, from a tomb in the island of Ægina.

Botany.

E. im Thurn exhibited a collection of upwards of 60 species of Fungi, comprising about 6 species of *Clavaria*, *Craterellus cornucopioides*, and different kinds of *Xylaria*, *Bovista*, *Dœdalia*, *Boletus*, *Coprinus*, &c.

A. MARSHALL then read the following paper on

THE STRUCTURE AND HABITS OF THE MOLE.

(Talpa Europœa).

I have chosen Moles as a subject for my paper, because Zoology has been less studied by the Society than the other branches of Natural History, and because Moles, living as they do under ground, are perhaps the least known of our common English mammalia, and therefore the better subject for a paper. *Talpa Europœa* is the only mole found in Great Britain, although there are the Scallops, or Shrew Moles of North America, the Shining or Changeable Mole of the Cape, and the Radiated or Star-nosed Mole of Canada; but I shall confine myself strictly to-night to the common British species, as this is the only one that is likely to be at all familiar to us.

As regards the structure of the Mole, the arms are short and of great strength, terminating in broad solid paws, and, from their shortness, are admirably adapted for shovelling out the earth, for if they were longer the earth would be constantly falling in, and so prevent the frequent repetition of its strokes. Compared with these the hinder parts and legs are small and feeble, and so offer no impediment to its course. The teeth are 28 in number, and, like those of all insectivorous animals, extremely sharp. The tongue is as large as the mouth will hold.

Some people assert that the Mole has no eyes, hence the expression "as blind as a mole," but it is not blind, as I have seen its eyes, although they are very small. In order to satisfy himself on this point a Mr. Le Court made two openings in a dry tiled drain, and caused some moles to be introduced successively at one end, while he placed himself at the other. If he stood quite still, the mole soon came out and escaped; but if he only moved his finger it stopped and turned back.

The idea that it has no eyes arose probably from the fact that by a peculiar muscular organisation it has the power of withdrawing them beneath the fur; were this not the case they would be frequently damaged while the Mole is making his excavations, by the earth falling into them.

Mr. Le Court also tried an experiment in order to discover whether a mole can hear. Having fixed sticks at short distances apart, in a very long mole run, he then introduced a horn at one end of the run, and blew down it. This frightened the mole, which set off at such a tremendous pace that Le Court's friends, placed at intervals along the run, agreed that the animal went as fast as a horse can trot.

The ear is of peculiar formation, having no external parts as is the case with human beings, but being a simple opening, capable of being closed at pleasure, which like the eye excludes particles of earth.

As regards its power of smell opinions are much divided; it is generally considered to be very acute, although many moles kept in confinement have seemed to be almost deprived of it.

Moles sometimes feed on birds and mice, but their usual food is worms and other insects, which they eat in great quantity. I have an anecdote in proof of this last statement. The Rev. J. G. Wood, having had a live mole given to him, kept it in a large box, and placed a worm several times within one-eighth of an inch of its nose without attracting its attention. This seems sufficient proof that the mole's power of smell is very limited, but if its snout or paw touched the worm, it pounced upon and eagerly devoured it. This mole eat so fast that Mr. Wood had considerable difficulty in finding sufficient worms to satisfy it; so he substituted a centipede, on touching which, however, with its snout, the mole threw up its head, and, with a stroke of the fore-paw, sent the centipede several inches away. The first batch of worms Mr. Wood gave it consisted of 6 good-sized ones, and one three times as long as the mole itself: after that he gave it more, and so voraciously did it eat that, inclusive of the time occupied in digging up the worms, it eat 14 in 13 minutes. In the evening Mr. Wood resumed the spade, and having heard a popular report that twelve hours' fast will kill a mole, he gave it, before retiring for the night, the large supply of two dozen worms, intending to feed it again about six o'clock the next morning. As it poured with rain, however, at that time, Mr. Wood delayed feeding it till nine o'clock; twelve hours had just passed since he gave it its supper, which must have taken it quite an hour to eat, as it had to hunt for worms about the box; but it had been dead some time, as it was already stiff.

Another instance recorded in the *Zoologist* proves its excessive ferocity. "A very large frog was put into an area with a mole, and the following scene then took place. The mole rushed at the frog, seized it by the hind-leg, and tore at the muscles of the thigh with the greatest fury. The poor frog screamed piteously, and made several frantic leaps. dragging the mole along with it, as the latter retained his gripe with all the pertinacity of a bull-dog. At last his hold gave way, and the frog continued to leap about bleeding profusely, while the mole seemed to be quite mad, turning rapidly round and round, sniffing at the blood stains on the gravel. On the frog being put out of his misery, the mole literally danced round his victim, worrying and biting at the skin of the belly until he tore it open, when he feasted sumptuously on the entrails."

The fur of the Mole, unlike that of other animals, lies flat in whichever direction it is rubbed, and is used for various purposes: mole catchers usually make purses of the skins, and I have heard of a gentleman having a great coat made of them; they are also much used for making caps, tobacco pouches, &c.

In this way Moles certainly are useful, but I think it is doubtful whether they are beneficial to land, as they throw up the grass or young corn, the latter of which they use as a lining for their nests—as many as 402 blades of young wheat have been counted in one nest, and all apparently so fresh that they must have been collected in the course of two or three days; and although some assert that they, like worms, help to drain land, particularly pasture land, others, allowing this, say that they remove the earth from the roots of the grass, causing a hollow underneath it, so that it dries up and withers. It is generally supposed (whether with any foundation or not I cannot say), that sheep always prosper best where there are many moles.

They are frequently caught alive, as when the ground is very hard their runs are so near the surface of the earth that it is easy to see where they are and to catch them.

The lodges are formed in the following manner. The mole selects a hillock of considerable size, and in this it constructs its nest. The earth forming this mound is well compacted together, and within it are many galleries and passages of communication, the arrangement of which is as follows. Two circular galleries are made, one at the top and one at the bottom connected by five galleries, at equal distances. In the centre is the mole's dormitory, which is connected with the upper gallery by three perpendicular tunnels.

The nest may easily be distinguished from the other mole hills as it is larger and higher. In order to form this the female throws up the earth and thus forms a large apartment, which is supported by partitions. All round the roof she beats firm the earth in order to keep out the rain and damp. She then procures a quantity of grass and dry leaves, as a bed for her young. Next she secures herself by forming passages leading from the nest in all directions, so that as soon as she perceives that her habitation is attacked, she and her young make good their escape through these burrows. Moles' runs are generally found in the neighbourhood of water, as it is necessary for their existence, and consequently after inundations moles are frequently seen swimming about endeavouring to escape; if it were not for these inundations they would multiply so fast as to do great damage to the farmer.

Among moles the male animal is most plentiful, and in consequence many fierce duels are fought before they can obtain a mate. One day, as a gentleman was walking in a copse, he heard a loud rustling, and saw two dark forms tumbling over each other, and evidently engaged in fierce combat; presently one retreated, quickly followed by the other. The gentleman, who had determined to try and catch one or both as soon as he discovered they were moles, jumped through the underwood, and accidentally stopped the fight, when both animals began to sink rapidly into the earth, but still not so rapidly but that one was secured by the skin of its back; the other made its escape. The captive was taken home, and put into a large tub, with some earth in it, and covered over with a board, in which he seemed quite at home, and enjoyed himself amazingly with a diet of worms. In this state he lived for three days, at the end of which time, the board being knocked off, he fell an easy prey to a cat, who killed but refused to eat him. The mole seems to be a very fierce animal, and if it were larger might be almost dangerous. One, on being caught, took hold of its captor's fingers between its teeth, and bit so hard that he was at last reduced to the unpleasant necessity of paying it out in its own coin, and bit it almost to death before it let go its hold. The colour of the mole is usually of a blackish grey, but there are great varieties, many of which may be seen in the British Museum. A cream-coloured one was taken in Wiltshire by a mole-catcher, and another of that colour in Richmond Park. The same man who took the latter caught a grey mole with an orange breast, and also one entirely orange, except the head, but it was too much decayed to be preserved.

There were 36 persons present.

MEETING HELD NOVEMBER 2ND.

Geology.

W. D. **Smith** exhibited some fossils from the Mountain Limestone.

Ornithology.

G. H. **Dawson** exhibited a specimen of the Grey Phalarope *(Phalaropus lobatus)*, shot at East Kennett, on Sept. 26th, by Mr. J. Coleman, and by him presented to the College collection; and also a specimen of the Sparrow-hawk *(Falco nisus)*.

Entomology.

F. J. H. **Jenkinson** gave a Report.

The President exhibited a specimen of the Feathered Thorn *(H. Pennaria)*, captured by the Rev. H. Bell.

A. P. **Hockin** exhibited a specimen of the Sawyer Beetle.

Archæology.

H. M. **Hilton** exhibited some Saxon beads, found in Kent, and also several coins, and read an account of the graves in which they were found.

W. D. **Smith** also exhibited a box of coins.

A. **Armstrong**, Esq., exhibited a half-groat of the time of Henry V.

The President exhibited a stone Celt, found near the College, and presented to the Society by S. B. Dixon, Esq., jun., of Pewsey.

Botany.

The President exhibited a specimen of the Corn Marigold (*C. Segetum*), a plant new to the College list, which had been found by E. im Thurn; and mentioned an instance of wheat germinating in an ice-house.

E. im Thurn exhibited several species of Fungi, hitherto unobserved in this neighbourhood.

The President then read the following paper, which he illustrated by numerous experiments, on

LIME.

The substance known by the name of *Lime* is composed of the metal *Calcium* and *Oxygen*. Calcium was first discovered by Sir Humphry Davy, but not being used specially in the arts, no trouble has been taken for obtaining it by a cheaper manner than by means of electricity: hence it is very scarce, a specimen, the size of a threepenny-piece, costing as much as £2 5s. It is of a light yellow colour, something resembling that of an amalgam of gold and silver. It resembles gold in being very ductile and malleable, capable of being drawn out into the finest wire, and beaten out into sheets as thin as the finest writing paper. In weight it is about 13 times lighter than gold. As it unites very readily with oxygen (keeping its lustre in dry air only for a few days), it is never found in nature except in combination with other bodies. In combination with oxygen it forms *lime*, but even this can only be obtained from other compounds, though it is, perhaps, the most widely diffused substance in nature. I cannot venture to enter upon a full description of its different combinations, but shall select some of the more important, and say a few words on each.

Lime itself is very easily obtained by the common process of lime-burning—any kind of lime-stone or chalk, free from impurities, after being submitted to a full red heat for some time (70 hours), will lose its carbonic acid and be converted into lime. In this state it is called *quick-lime*. It is brittle and white, and "being extremely infusible, is the substance selected for ignition with the intense heat of the oxyhydrogen blow-pipe, to obtain the beautiful white light called the "Lime-light." The oxy-calcium light is produced by passing a stream of oxygen through the flame of a spirit lamp so as to strike against a cylinder of lime. A very brilliant light is thus produced, though not equal to that produced by oxygen and hydrogen.

Quick-lime is much used for improving lands, for clarifying the juice of the sugar-cane and beet root, for purifying coal gas, for clearing hides of their hair in tanneries, and for various other purposes.

Lime has a great affinity for water, and consequently must be kept in a dry place, otherwise it will absorb the moisture and fall into powder.

When water is added to Lime it unites chemically with it, and forms hydrate of lime. This process is called "slacking," and is accompanied with the evolution of considerable heat. Slacked lime is used principally for making mortar. Bricklayers have several kinds, more or less suitable for the purpose. The *rich limes* are so called on account of the large increase of volume they assume when water is added to them. In fact by absorbing about 1¼ times their bulk of water, they expand to more than four times their original size, and of course such limes are preferred by bricklayers. But mortar made from these limes is very soluble in water, and hence is not suitable for *outside* work or work under water. For such work *hydraulic limes* are required. These limes have sometimes as much as one-third of their bulk composed of silicate of alumina. Hydraulic limes of the best quality do not swell so much or give out so much heat in slacking, but are nearly equal to cement for the purposes of brickwork.

Lime water is merely a solution of hydrate of lime: it is very useful in medicine. The most interesting fact connected with it, is that when cold it holds more lime in solution than when hot. This is still more the case when the lime is united with carbonic acid, and consequently water charged with this carbonate of lime (as is the case with water from chalky districts), deposits large quantities of it in the vessels in which it is boiled, and produces what is called *fur* in kettles, &c.

Lime has a great affinity for carbonic acid. If lime water be allowed to stand exposed to the air, the carbonic acid in the air unites with the lime and forms a thin coating over it composed of the substance called carbonate of lime. If carbonic acid is forced into it in any way (as by blowing down a tube one end of which is immersed in the lime water), a white precipitate of carbonate of lime is immediately formed.

This leads me to speak of the most important compound of Lime—viz., *Carbonate of Lime*. In this form it is most abundant in nature. Among the varieties of Carbonate of Lime may be mentioned the following:—

Limestone—the name given to all massive varieties occurring in beds. In this form it is most abundant. Considering only England, it is found in different layers of great extent in the Silurian Strata, extending over Cumberland and Westmoreland, the northern part of Lancashire, and the eastern part of Wales. Another variety, the *Devonian Limestone*, occurs extensively in Devonshire. The *Carboniferous*, or *Mountain Limestone*, is found almost uninterruptedly over Derbyshire, the southern part of Lancashire, the western part of Yorkshire, Durham, and Northumberland, (the whole of the Pennine Chain and nearly all the Cheviot Hills being composed of this alone). And the *Magnesian Limestone*, or Dolomite, not occurring in very extensive beds in England, though it does so elsewhere. Limestone, occurring in such large quantities, is of considerable use, especially for building purposes. The most durable is the Magnesian limestone, or Dolomite, of which the new Houses of Parliament are built. It is curious, however, that it is not always of the same durability. The stone for the new Houses of Parliament was unfortunately procured from a poor vein, and consequently is already becoming affected by the weather. The Cathedrals of Milan and York Minster are both made of Dolomite, which being of a good quality, has stood the test of the weather very well.

Near Sunderland is a very interesting variety of Magnesian Limestone, unfortunately in very limited quantity, occurring in thin bands, and perfectly flexible, hence called *Flexible Sandstone.*

The next important variety of Carbonate of Lime is *Oolite,* so called from its resemblance to the spawn of fish. It consists of small round grains, and occurs in large quantities in England forming a strip of variable width (sometimes as much as 60 miles broad), extending from the northern part of Yorkshire to the south of Dorsetshire, where it terminates in what is known as the Isle of Portland. "Portland Stone," a variety of Oolite, is too well known as a valuable building stone to require further comment.

The last important variety of Carbonate of Lime occurring extensively in England is *Chalk,* forming the whole of the remaining portion of England as far as the German Ocean, upon which, however, in the eastern part, lie the tertiary Strata, and between the North and South Downs the Wealden formation. When we consider the large area covered by chalk, and also the fact that the layer of chalk, is sometimes 500 or even 1000 feet in thickness, we shall have a fair idea of its great abundance in England.

A still greater interest attaches to this variety of Carbonate of Lime from its being the product of organic remains. It consists of minute fragment of coral reefs and shells, and of enormous quantities of infusoria and other microscopic organisms. As we are situated on the great central plateau from which the various chalk ranges radiate, it will be unnecessary to say anything as to its appearance. The characteristic of a chalk country is a series of undulating hills; certain plants are peculiar to a chalk district, but chalk itself is not favourable to the growth of trees—hence the generally bleak appearance of our Downs.

Chalk is extensively used in lime-burning, and as a manure for some soils.

The last extensive formation of Carbonate of Lime is *Marble,* of which many varieties may be enumerated. Its great characteristic, however, is its crystalline structure. It is composed of a mass of minute crystals, and is capable of taking a fine polish. Marble is not found in any great quantity in England, though some varieties are found here. The English varieties are frequently beautifully variegated with fossil shells, &c., giving them a very handsome appearance. Some foreign varieties are of great beauty and rarity —one, the Giallo Antico being now especially so, as the quarry from which it was obtained was filled up, and has not been re-discovered.

Stalactites and *Stalagmites*—caused by water charged with Carbonate of

Lime in solution. The former is the name given to the long pendants from the tops of caverns: the latter to the masses of Carbonate of Lime which cover the floors. They are frequently of different colours arranged in bands—the so-called "*Gibraltar Rock*" is Stalagmite from a cavern in the Rock of Gibraltar.

Some streams are so charged with Carbonate of Lime that they deposit it on any objects which may be placed in them. In this way "Petrifactions" are formed. By merely suspending articles in the water, or where it can drop upon them, a coating of Carbonate of Lime is formed over them. If the article be perishable (as a straw), it decays after a time, but a perfect cast is obtained by means of the Carbonate of lime deposit.

Wood is also often petrified by Carbonate of Lime, and occasionally whole trunks are changed into stone. The specimens show well the grain of the wood, and some are very handsome when polished.

Satin Spar is a fibrous variety, capable of receiving a fine polish.

Iceland Spar, so called from having been first brought from Iceland. Of this there are innumerable varieties of crystals, some of them of great beauty, the most important of them being a very transparent variety, never found in perfect crystals, and called *par excellence* Iceland Spar. This mineral is of great use in optics. It splits very easily, but always in the form of rhombs, and has the remarkable property of being double refracting (whence the name of Double Refracting Spar is sometimes given to it). By this property, an object placed on one side of it in certain positions is seen double, and by twisting the spar round, these two "images" as they are called, gradually overlap till at length they unite. On further twisting it round they separate, reaching their greatest distance from one another when turned round a quarter of a circle from the position in which the images were seen together.

Such are but a *very* few of the varieties of Carbonate of Lime. A question may therefore arise to some of you, how am I to know Carbonate of Lime when I see it? In the first instance, all the varieties are scratched easily with a knife; then they effervesce strongly in acids; and, thirdly, are perfectly infusible before the blowpipe.

Another species, identical in composition with Iceland spar, but of a different kind of crystallization, is *Arragonite*, so called from being very abundant at Arragon, in Spain. The crystals of this species are very interesting, many of them being compounded of two or three flat crystals crossing one another so as to form a star. A form of Arragonite in an uncrystallized state is called *flos ferri*, or flower of iron, looking like a tangled white cord.

Finally, carbonate of lime occurs in the shells of birds' eggs, and the so-called shells of crabs and lobsters; also in the shells of oysters, and other "shell-fish."

Carbonate of lime is used in making glass, and in the reduction of iron.

The next important compound of Lime is *Sulphate of Lime*, composed of Sulphuric acid and Lime.

The most important variety of this compound is Sulphate of Lime with two equivalents of water, forming the mineral called *Gypsum*. In a very pure state it is called *Selenite*, a substance very useful in optics. Gypsum is very easily separated into extremely thin layers. When light has been "polarized" (*i.e.*, when half of it has been taken away), and is then transmitted through a sheet of Selenite, various colours are produced, according to the thickness of the sheet. Hence if a series of plates of Selenite of different thicknesses be procured, remarkably pretty patterns can be made for exhibition under the polariscope.

If the water be driven away from Gypsum by means of heat, a hard substance remains, easily reducible to powder. This powder, when mixed up with water, becomes, in drying, hard and compact, and is therefore useful for taking casts, making models, giving a *hard finish* to walls, &c., and is generally known by the name of *Plaster of Paris*.

Alabaster, another variety of Gypsum, is useful for making vases, ornaments, statues, &c., being beautifully white and translucent, and of a fine texture. It is also very soft, so as to be cut with common cutting instruments.

Gypsum, when ground up, is used as a manure, or rather *corrective* of soils.

Both Carbonate and Sulphate of Lime are almost insoluble. Were it not for this insolubility of Lime, we should witness great changes in the earth's surface. Instead of having fine limestone rocks, they would be reduced to a mud by the rains, and thus the whole face of nature would be changed. But though Carbonate of lime is thus almost insoluble, yet when water, charged with carbonic acid, comes in contact with it, a certain portion is dissolved, and hence we get what is called "hard water," so characteristic of chalk countries. This water, as before observed, is very liable to leave a deposit inside the kettle in which it is boiled.*

Another important compound of Lime is that of Phosphoric acid and Lime, called *Phosphate of Lime*. It is this which gives firmness to our bones. Bone itself is made up of the hard substance Phosphate of Lime and gristle, the latter giving it toughness and elasticity, so as to preserve it from being easily fractured.

The late Professor Henslow was the first to direct attention to numerous nodules found in the Green sand formation. These, on analysis, were found to consist of Phosphate of Lime, and passed under the name of *Coprolites*. These nodules, when ground, are mixed with sulphuric acid. The acid unites with part of the Lime, forming sulphate of Lime (Plaster of Paris), and leaves a substance with an extra supply of Phosphorus, called Super-phosphate of Lime. This latter is a most excellent manure—the Plaster of Paris is not, and hence it can, if necessary, be extracted; but the good qualities of the Super-phosphate of Lime are so great that they more than counteract the bad effects of the Plaster of Paris, and so no trouble is taken to separate the two. The preparation of "Coprolites" is very important in Cambridgeshire and the adjoining counties.

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* The deep holes, so frequent in this neighbourhood, called *Pot-holes*, are caused by water charged with Carbonic Acid coming in contact with the chalk, dissolving it, and then running off through crevices or fissures.

Chlorine and Calcium, or Chloride of Lime, called formerly Muriate of Lime, is also an important compound. Having a great affinity for water it is used for drying gases. When heated and taken to a dark place, it shines like Phosphorus, and is hence called Homberg's phosphorus. Crystals of this substance, when mixed with snow, produce intense cold.

I shall only mention two other compounds—*Fluorine and Calcium*, forming *Fluor Spar*, and *Oxalic Acid and Lime*, forming *Oxalate of Lime*.

The former is found abundantly in Derbyshire, and is frequently called *Derbyshire Spar*. It occurs frequently in cubical crystals of various colours. When heated on a hot iron plate it emits a bright light of various colours. When pulverised, and mixed with sulphuric acid, a gas is given off, which corrodes glass. Advantage is taken of this in etching on glass. The glass is coated with a thin layer of grease, on which is scratched the subject to be etched on the glass. It is then submitted to the action of this gas, which corrodes the parts of the glass not covered with grease.

Fluoride of Calcium is found in the enamel of the teeth, in bones, and some other parts of animals, and also in certain parts of many plants; and by vegetable or animal decomposition it is afforded to the soil, to rocks, and to coal beds, in which it has been detected.

Fluor Spar is used extensively for making ornaments—it is however very brittle, and requires much care in working. It is also used as a flux to aid in reducing copper and other ores, hence the name *fluor*.

Oxalate of Lime occurs in many plants, and is the substance of which calculi, chalk-stones, &c., in the human body are composed.

Should a person foolishly attempt to poison himself with oxalic acid, some of the lime scraped from the wall and swallowed will form an insoluble substance with the acid, and thus his life will be preserved.

There were 55 persons present.

S. B. DIXON, Esq., Jun., at a meeting of the Geological Section, read the following paper on

THE DRIFT NEAR MARLBOROUGH.

I purpose, in this paper, to explain some of the Drift Deposits that are found near Marlborough, and the probable causes of their formation. The deposits to which I shall refer are—firstly, those which rest on the chalk and cover nearly the whole country round Marlborough; and, secondly, the detached patches of gravel and silt in the vallies. There are frequent examples of the first of these between Granham Hill and Martinsell Hill, where the country is covered with a mass of unstratified matter, partly clay mixed with rough unrolled flints, partly clay alone, and in some cases, though more rarely, a fine siliceous sand, the whole lying in an irregular manner on the chalk. In the sides of the cutting of the Marlborough Railway, close to Granham Farm, the chalk appears to come up in a succession of jagged peaks, the hollows between these peaks being filled up with these clay and flinty deposits. Blocks of a hard siliceous stone, called Sarsen Stone, are occasionally mixed with the clay. These deposits belong to one of the earliest forms of drift. The second is the more usual form, and is commonly found in vallies through which continuous streams are running, or have formerly run, or where periodical or accidental inundations take place. If the course of a stream is observed, it will be seen to be constantly encroaching gradually on the side where there is the deepest water, and deserting the opposite side, where the stream is becoming shallower, this latter side being destined eventually to be left dry. Where the stream flows strongest, a mass of coarse gravel is carried along with it, while in the quieter water sand and mud are being continually deposited at the bottom. When the stream overflows its banks, as during floods or inundations, it will be seen that when the parts which have been inundated have become dry, there is always left on them a thin film of sand and mud. When the stream has altered its course by wearing away the banks on the side where the water is deeper, the opposite bank will for a certain distance be left dry, and on this there will be a quantity of the silt and gravel that has been brought down by the stream. This latter would be a drift gravel deposit, and if a deposit had been formed by continuous inundations, or in a sort of bay, with still and quiet waters, there would be a drift clay deposit, usually called "loess." These gravel and clay deposits belong to a series called the "Post Pliocene," and they have been principally formed since the country has, to a great extent, attained its present configuration. In these deposits are frequently found the bones of elephant, rhinoceros, and many other animals, whose habitation in this country is only known from their remains being discovered embedded in the earth. Bones and teeth of horse and ox are also common. There is another and equally important agency in the formation of drift, which is the "glacial" or "ice" agency. Deposits of this formation are called "Boulder Clay," or "Northern Drift," and have been produced by glaciers, which have ground and worn away in their course a mass of substance from the rocks they have passed over, and on coming to a higher temperature have melted, and deposited this substance. As, however, I am strongly of opinion, that there is not any trace of the Boulder Clay in this neighbourhood, I shall not enter into further explanations of it.

I shall now proceed to explain the Drift I first mentioned, and the probable causes of its formation. As I mentioned before, the greater portion of the high country between Granham Hill and Martinsell Hill is covered with a mass of unstratified matter composed of a dark red clay largely mixed with rough angular flints. This deposit is called by the geological surveyors "clay-with-flints," and I shall use that name throughout this paper. Above this is a mass of the same sort of clay, but without flints. This is called "brick-earth." Not uncommonly in this brick-earth there are large blocks of sarsen stone, sometimes lying at the bottom of the brick earth, and resting on the clay-with-flints, and in other places mixed with the brick-earth. Where, however, in this high level country there is a valley, there is a total absence of the clay-with-flints and the brick-earth.

In the railway cutting by Granham Farm the chalk presents the appearance of a mass of irregular peaks. This appearance has been produced by a succession of holes called "sandpipes," or "pot-holes," which have been worked in the chalk, and then filled up with the clay-with-flints and brick-earth.

To account for these deposits and the peculiar appearance of the underlying chalk, I think that the whole of this chalk district must have been originally covered with a stratified deposit belonging to the Eocene formation, (which, I need hardly say, is the lowest division of the Tertiary), probably a very early one, and containing clay, sand, and sarsen stones: this deposit must have been subjected to a submergence, which altered the whole form of it, and a considerable portion was denuded. When this submergence had ceased, an amorphous mass of unstratified matter, composed of clay and sand, with the blocks of sarsen stone, was left, overlying the whole of the district. From the decay of the vegetable matter mixed with this mass (as vegetation always seems to flourish in Tertiary strata) a quantity of carbonic acid would be generated, and the surface water would become charged with this carbonic acid. The water sinking downwards would work on and gradually dissolve holes in the underlying chalk. The carbonic acid and the dissolved chalk, forming a carbonate of lime, would freely percolate the surrounding walls of chalk and escape through them, and through the bottom of the holes that had been formed, and in the course of time large masses of dissolved calcareous rock would be carried away. As a hole is being formed in the manner above mentioned, it is filled up with the superincumbent clay, and the chalk flints, from which the chalk has been washed away, would sink at the same time and mix with the clay. These together would form the substance called clay-with-flints, which, as a rule, fills the lower part of the sandpipes or pot-holes, the remainder being filled with the brick-earth. The clay-with-flints would always be below the brick-earth, though sometimes the whole is absorbed into the clay-with-flints. There is occasionally a thin coating of dark coloured clay round the sides of the sandpipes, which has probably been left from the decay of the chalk. Sand has also frequently worked into the sandpipes with the clay.

At the time these sandpipes were in formation the surface water had begun in some places to wash away the clay and sand, and thus make for itself channels. These would be largely increased by subsequent rains, and eventually the vallies so commonly seen in all down country would be formed. Where the sarsen stones have been mixed with the clay and sand, they have sunk to the bottom of these vallies, and now present the picturesque appearance that is seen in the vallies of stones in this neighbourhood. In these vallies the clay with flints and the brick earth are absent, and the sandpipes have not been formed in the chalk, as the agencies for producing them would have been washed away by the water in its course. I do not think that any further geological change has since taken place in the high level parts of the district, beyond the ordinary atmospheric changes that are continually going on. No fossils or mammalian remains have been discovered in these deposits, except flint casts of fossils, that have been washed out of the chalk.

Following on the above-mentioned changes there comes the formation of the Vale of Pewsey. I do not intend in this paper to go into the causes of the formation of this valley, but I would refer you to a most excellent paper on "The Geology of the Berks and Hants Extension and the Marlborough Railways," written for the Wilts Archæological Society by Thomas Codrington, Esq., F.G.S., where the formation of the valley is most ably discussed, and the altered Tertiary deposits more clearly explained. I would however mention, that I believe the valley to have been formed by the action of the sea, and that the direction of this action was from the south-west to the north-east, not down the valley, as you would be led to suppose from the first sight of it. That the formation of the valley was subsequent to the deposit of clay-with-flints and brick earth is, I think, most satisfactorily determined by the appearance of the chalk escarpment on the right hand side of the road going down Oare Hill. On the top of this escarpment there are sandpipes filled up as those I have described, but on the southern side a considerable portion of the substance with which they are filled has been washed off, and the lower they are in the slope, the greater has been the denudation. After the Pewsey Vale had been eroded by the action of the sea, and after the sea had left it, the general height of the bed of the valley must have been from 90 to 100 feet, at least, above the present level of the streams now flowing through it, and the course of the streams round Pewsey took a contrary direction to that of the sea, when the valley was eroded—the streams all flowing from east to west. The earliest deposit that appears to have been left by the streams, is the flint gravel, on Pewsey Common (about mid-way between Oare and Pewsey). This deposit is one of the Post-Pliocene series. It rests on the greensand, and is a mass of chalk flint mixed, though not to a large extent, with a red ferruginous clay and greensand. The flints appear to have had but little, if any, rolling, and evidently were not brought from any great distance. There are occasionally pieces of sarsen stone embedded with them. Although a considerable quantity of this gravel has been dug for road material, I have never heard of any mammalian remains having been discovered in it. Probably if any had ever been there, they would by this time have been destroyed, as the substance would not be a good one for their preservation. Sponges and fossils washed out of the greensand are, however, not uncommon.

The next drift deposit that is found in this neighbourhood is a bed of Post-Pliocene drift close to Pewsey. A good section of this can be seen in the railway cutting near Pewsey Station. This bears a great resemblance to that at Pewsey Common, except that it is much thicker (sometimes, where the underlying greensand has been eroded into gullies, attaining a thickness of 15 feet), and there is a larger quantity of clay with the flints. In some cases there is a fine siliceous sand, which shows signs of stratification. When this deposit was made, the level of the river had been lowered about 35 feet since the Pewsey Common Deposit. During the making of the railway several molars of the *Elephas primigenius*, or Mammoth, were found. They were very much decayed, there being scarcely sufficient substance remaining to hold the enamel plates together. Bones and teeth of the horse (*equus fossilis*), were also found. Of somewhat the same age as this deposit is a quantity of clay at Kepnall (about a quarter of a mile east of Pewsey). There is a large quantity of greensand mixed with this clay. No mammalian remains have ever to my knowledge been found in it, although it has been dug for many years for making bricks. In some places it is seven or eight feet thick, though more commonly from two to three feet. From the time of the deposit at Pewsey Station to the present time the stream must have altered its level and become from 50 to 60 feet lower, and during the whole time continually changed its course. Over a large extent of country round Pewsey there is a deposit of river silt composed of small rolled pieces of chalk mixed with sand and flint at different heights above the present level of the stream. This is more particularly on the southern side of Pewsey; occasionally there are beds of white clay of the same date. Remains of mammoth have been found in this deposit, and it is probable that if further excavations were made other mammalian remains would be found.

The valley through which the Kennet now flows, I should imagine, was originally formed at the time of the drift I have first described, and was one of the vallies that were eroded at that age. The level of it must then have been at least 50 feet higher than it is at present. At a much later period the present river commenced flowing through it. There is a good section of the river silt in a meadow at the back of Wye House, about 50 feet above the bed of the river, showing most conclusively that the river originally flowed at that height. This silt is composed chiefly of chalk, flint, and sand, with broken pieces of very small fluviatile shells. The great interest that has been given to these Post-Pliocene deposits during the last few years has arisen in consequence of the discovery in them of flints, which show the most undoubted signs of human workmanship. These flint implements have been found in large numbers in many of the river vallies, and in deposits, which, though geologically recent, must be of immense antiquity, and it is evident that man must have been inhabiting this country contemporaneous with the elephant and rhinoceros. The implements, though very rude, appear to have had some care paid to them in making, as there is generally much uniformity in their shape. They have been formed by chipping alone, and do not show the least trace of rubbing, like the stone implements of a later date. I imagine they were for both domestic and warlike use, though, I must admit, I have been at a loss to assign the slightest possible use to some I have seen. I have never heard of any of these implements having been found in the drift in this neighbourhood, still I am in hopes that some may yet be found, if every section is carefully examined.

I will now recapitulate the principal parts of this paper to which I am anxious to draw your attention—

Firstly,—That the whole of this district was covered with some of the earlier Eocene strata.

Secondly,—That the whole of this was submerged, and was subjected to great denudation and alteration.

Thirdly,—That after the submergence, an amorphous, unstratified mass, composed of the altered Eocene strata, covered the country, and that, following on this, the sandpipes or pot-holes, and the vallies on the high country, were formed.

Fourthly,—That after this the Pewsey Vale was formed by marine currents acting from west to east.

Fifthly,—That the high level Post-Pliocene deposits of the Pewsey Vale were then made by streams, flowing from east to west, and that these streams subsequently deposited the river silt and clay in the Pewsey Vale.

The Kennet Valley being originally a valley formed at the earlier age, and, at a much later period, becoming the bed of the present river.

I would also mention that I do not consider there is the smallest trace of "boulder clay" in this neighbourhood. If it had been present, I think we should have found it on the sides of the chalk escarpment, and of course it would be of a date subsequent to the formation of that escarpment. This is the position it occupies on the chalk hills some distance up the Swindon Valley. It is too frequently the case, to attribute to glacial action any phenomena that cannot be easily explained by other causes.

As the immediate subsoil of this College is drift, I think this subject deserves most especial study from all Geologists here, and I would most strongly advise you to examine carefully every section you can find, and at the same time if you see any flints that bear the slightest appearance of chipping, to bring them away and examine them more carefully at your leisure. I have more than once been rewarded when I have done this. A most interesting discovery of flint implements has been made at Salisbury within the last few years, and many have been found in sections that have been made to lay the foundations of buildings.

MEETING HELD NOVEMBER 16TH.

Ornithology.

G. H. Dawson gave a Report.

Botany.

The Rev. J. J. Pulleine read an extract from Baker's "Nile," giving an account of the Potato Whisky, alluded to by the President in his paper on the Potato in the preceding half-year.

The President exhibited a Mexican gourd.

E. im Thurn exhibited several species of Fungi.

Geology.

C. A. Harrison exhibited some fossils from the Silurian system, viz., *Orthoceras Brightii* and *Graptolites.*

The President exhibited some quartz crystals, coloured by iron.

Archæology.

H. M. Hilton exhibited a large number of coins, among which were a sixpenny piece of the time of Queen Elizabeth, a coin of the Emperor Constantine, a Spanish Real of the time of Charles IV., and various others.

T. R. Dumergue gave a description of Avebury, which he illustrated by a plan; and exhibited a bowl stand from Pompeii.

The President exhibited two vases, and a small piece of Etruscan pottery, as well as some ornaments of scented clay, modelled by the hand, made by the nuns at Santiago.

H. M. Moule, Esq., mentioned that the Rev. W. Barnes had told him that the word "Savernake" was derived from an old word, "Scovarnoc," meaning "the eared creature" (*i.e.*, the Hare).

H. M. Moule, Esq., then read the following paper on

THE HUMAN BRAIN.

If a "little learning" is ever "a dangerous thing," it is more especially dangerous in the study of anatomy. I do not say that a small amount of anatomical knowledge is necessarily an undesirable thing; but only what the line says, that it is *dangerous*. For, first, to dabble in anatomy *may* only serve to stimulate a perfectly useless curiosity; and any one who takes up this pursuit prompted only by vain curiosity seems to me to be something like a housebreaker in the House of Life. And, next, a little ill-digested anatomy *may* do harm by breeding useless fears and anxieties, the ill-instructed person fancying that he has this or that malady, until on consulting a genuine doctor he discovers himself to be as sound in wind and limb as ever he was. Now, let these few words be sufficient to warn frivolous and trifling thoughts off the ground which I am going to occupy to-night. And let me go on to add further, on the other side of the question, that, supposing anatomy to be approached with the earnestness and thoughtfulness which it deserves, there is no branch of knowledge from which we may learn more thoroughly the nature, both of science itself, and of scientific study. No kind of knowledge gives a fairer insight into the endless ramifications of research, and the many sided nature of enquiries in the field of Natural History. For example, in treating of the human brain, one might take at least half-a-dozen points of view. One might speak of its anatomy, or the laws of its structure: of its physiology, or the laws of its functions and operation: of its pathology, or the phenomena which it presents in a state of disease: of its comparative anatomy or its relation to the brain of other animals: of some unusual condition of the brain, such as somnambulism, delirium, and coma.

I need hardly say that my object at present will be merely the humble one of presenting you with a few detached details, such as in my opinion are best calculated to introduce you to the threshold of a subject beyond which I am not qualified to lead you. I propose, that is, very briefly to touch upon the bare outlines of the brain-*anatomy*, with a few notes on its *comparative* dimensions: on the *functions* of the brain: and on one or two of its unusual *conditions*.

What is commonly called the brain is a certain portion of the great cerebro-spinal system of nerves. This great system is roughly divided into three parts—(1) the *cerebrum*, (2) the *cerebellum*, (3) the spinal *column*.

First, to speak of the cerebrum. If the skin of the head were gently reflected, or turned back over the skull—somewhat in the manner that an

Indian might do with his tomahawk, and if then the bone were gently sawn through, and the lid of the skull (as it were) carefully lifted up, you would see beneath a whitish, shining membrane, freely marked with arteries, like a map with a plentiful system of rivers. This is the *dura mater*, or outer covering of the brain surface. Immediately below it is a second membrane, of much finer texture, so as to be actually transparent. This is called the *pia mater*, and it lies directly over the brain proper (or *cerebrum*) itself, which wonderful organ lies open to examination on its removal. The masses of soft, grey substance, of which it consists, are divided (as the eye can at once detect) into two equal *hemispheres*, right and left; and each of these hemispheres is divided into an anterior, middle, and posterior *lobe*. The word lobe means fold or mass, (akin to "lap"), and is applied to sections of other parts of the body, for instance, of the ear, the heart, the lungs; and also of the leaf, and the cotyledon of the seed, in plants.

Below, and somewhat behind the cerebrum, lies the *cerebellum*, a much smaller portion of the entire brain, but closely resembling the larger part in form and substance. It was in the pineal gland of the cerebellum that a popular theory of the ancient naturalists placed the seat of the soul. The cerebellum rarely exceeds in weight one eighth or ninth part of the weight of the cerebrum. These two portions together, as having their seat within the skull or cranium are called the Encephalon.

The remaining portion of the cerebro-spinal centre of nerves is called the *spinal column*, from its being chiefly enclosed within the hollows of the vertebræ. The extreme upper part of the column is called the *medulla oblongata*, and this part, as included within the skull, is in strictness part of the encephalon. Any injury done, by dislocation or otherwise, to the spinal column, affects health or life in much the same way as an injury done to the brain: it occasions, that is, partial or total paralysis, or death. Its substance is essentially the same as that of the cerebrum, and like it the spinal column is enveloped in protecting membranes.

If the figure of the brain and its adjuncts be thus elaborate and remarkable, we are compelled to still higher admiration when we think, next, of its *functions*. These may be easily and instructively grouped into the functions of *animal* and of *intellectual* life; though we should bear in mind how closely the two great divisions border on each other, and how often their developments are connected so as to render distinction difficult. In our merely animal life we are indebted to the brain for the powers of *motion* and *sensation*. These may in a state of disease become disunited, and a man may lose the power of movement, retaining that of feeling, in whole or in part, or *vice versâ*. We are so much accustomed to the enjoyment of these powers *in full*, that we fail to estimate their extent and their variety. But here they are, quite distinct yet harmonizing admirably, and all centreing in the wonderful organ we are now considering. What sensation is to the body, emotion is to the mind; and what motion is to the body, all the active intellectual operations (which, for shortness' sake we will sum up under the wide term of the *will*) are to the mind. We may, that is if we so choose to do, classify our debt to the brain in this method, and I do not know any consideration that suggests higher notions of its complexity and power. A few words may be added about the guesses (for I think scientific men would hardly call them much more than guesses) that have been made upon the connexion between this and that part of the brain, and this and that function of mind or body. The circulation of blood within the brain is said to be most important towards maintaining the *nervous* power of the body; the power to resist shocks and to undertake effort; all that we understand by tone and spirit. The chief intellectual operations probably have their seat within the convolutions of the cerebrum itself: and the cerebellum has been said to be the main point both of *emotion* and *locomotion*. If this is so, one gains some interesting light on the very obvious connexion between some mental impressions and bodily movements; of which the phrases "to quake with terror," "to dance with pain," "to be bowed down with agony," "to jump for joy," are examples.

The human brain is, with some few exceptions, the largest in relation to the size of the body among all the members of the Mammalia. Some of the smaller apes, and some of the *Rodentia*, are said to be exceptions. Some details of comparative weight may interest you. It must be mentioned that the weights in each case are Troy; and that they are calculated on averages taken in hospital observations upon a hundred or more brains in each instance. The average weight of the human brain is found to be about 3lb. 2oz.; the *minimum* of a healthy brain, 2lb. 5oz. But the *maximum* of a horse's brain is seldom more than 1lb. 7oz., although the weight of the body of a full-grown horse is considerably more than twice that of a man's. The brain of an elephant, seventeen years of age, was weighed about thirty years ago, and found to reach 9lbs. That of a whale, 75 feet long, weighed 5lbs., the relation of brain to body in each example being very much less than in the case of the human brain. The brain of man has been found in rare cases to reach a weight as high as 4lb. 8oz.: and this, I think, was the exact measurement of Porson's brain, which was examined after death. Cuvier was found to have a brain of no less than 4lb. 11oz. in weight, but it must be remembered that he died in a state of cerebral disease. The brain of an idiot has been found to weigh little more than 1¼lb. Without attempting to touch the controversy on the exact position of the negro in the human family, I may state this much: that recent dissections prove the negro brain to be, as compared with the Caucasian, not inferior in size, not different in colour, and not materially differing in either arrangement or substance.

Following the line which I have thought most likely to interest you, and perhaps to instruct, so far as new glimpses of thought or old thoughts in a new dress can instruct, I have only now to speak of certain temporary conditions of the brain; of the healthy intermittent repose, called *Sleep*: and of the morbid or artificial states of excitement or collapse, called *Somnambulism, Delirium,* and *Coma.* What sleep is, is a deep and difficult physical question, far out of our depth at present; but the details and conditions of sleep are within our notice, though they often escape it. Sleep exacts from us, on the average, a third part of our lives; a man who has lived sixty years has slept away twenty, more or less. The brain is not, however, idle during this long repose from active exertion. During sleep we can *reason*, we can *invent* or compose, and we can follow the suggestions of sensation with remarkable accuracy. We reason.—Condorcet used to say that he could, and did, often carry on during sleep calculations and arguments made during his waking hours. Jeffrey, when in full practice at the bar, declared that after reading through an ill-digested mass of evidence over-night, he found it in the morning arranged and (so to say) crystallized round its proper points of attraction. And even among ourselves, the familiar fact that "repetition" is better learned over night, shows that the brain is sometimes not idle even during sleep. I am speaking now, as every one perceives, of healthy sleep. The phenomena of mental operation during slightly excited or artificial sleep, might occupy a very large space. To this class perhaps should be referred Coleridge's remarkable and beautiful lines composed during sleep *(Kubla Khan)*. But these are not the only specimens of their kind, and it is probable that more than one of us may be able within our own experience to testify to the power of composition during sleep, at any rate to some small extent. The brain is also susceptible of trains of thought arising from the suggestions of sensation during slumber. A man having a blister applied to his feet will fancy that he is climbing a volcano, and treading on the lava of Vesuvius. If a hot application be made to his head, he will believe that he is about to be scalped. I have little doubt that many of such recorded cases might be found, if carefully examined, to belong more strictly to artificial somnambulism, and to be examples of the power which one person's *will* may acquire, by way of direction and suggestion, over the mind of another. For instance, in the case of a sleeper who was induced (while still apparently soundly asleep) to fancy himself carrying on a long talk with the lady of his love, sustaining a quarrel with her, and making it up, it is likely enough that the sleep was not complete, and that the patient, with that half surrender of will and consciousness into another's hands which is seen in mesmerism, was passively following the suggestions of the humorous friends who were playing upon him.

Somnambulism is much too wide a subject to be talked of in detail here. The natural somnambulism is a morbid development of the conditions of sleep.

The brain is in some respects as completely quiescent as during healthy slumber: in others, it is far more active, for instance in the power of locomotion and of receiving impressions through the senses. The somnambulist condition produced by mesmeric agencies is clearly one which is beset on all sides with probabilities of deception. It forms the subject of many able and careful scientific treatises but I should only be wasting time, were I to attempt to speak now of its symptoms and nature.

Delirium and coma are two unnatural states of the brain which often accompany a dangerous crisis of illness, or the last ebbing efforts of life. Coma is a complete prostration of sensibility and vital power. The action of the heart and lungs becomes extremely weak, and is sometimes scarcely perceptible. The name "coma" is also given to the artificial state of prostration produced by chloroform and other powerful agents. When a patient is chloroformed, a considerable strain is put on the action of the heart, and the pulse is therefore most attentively watched by the administrator. Delirium may be described as a prolonged and aggravated dream, though this description is far from being adequate fully to meet the endless phenomena of this very remarkable condition of brain. Impressions and ideas during delirium pass the brain in too rapid succession for the will to seize, and therefore for the reason to operate upon them. Apparently awake, the patient will often fail to recognise his dearest friends, and is totally incapable of sustained rational conduct, though certain powers of mind are sometimes stimulated to a very surprising extent. This is especially the case with the memory. Cases are on record of a Welshman, absent for thirty years from his native place, and known to have completely lost the power of speaking Welsh, recovering this power suddenly during delirium; of a servant girl uttering many words and phrases in Hebrew, which she had once picked up from a loquacious scholar in whose service she had been; and of a French countess, who, born in Brittany, had learnt the language of the peasantry during childhood, and who, after long losing it in her conscious thoughts, reproduced it during delirium when no one but a Welsh servant (Gaelic) was able, to the surprise of everyone, to explain the strange speech.

I have added these few details, to the very brief and imperfect notes on the brain now laid before you, because I believe that a few words of quiet explanation on matters which cause terror and anxiety to completely uninformed persons, are likely to lessen or remove the shock of such feelings. Never forget, whatever unusual sensations you may have, that thousands of human beings have suffered the same before you, and that science has been beforehand and is still in advance of you, steadily and calmly inquiring, gently and skilfully testing and applying the means of alleviation and cure. Aid science and obey nature, by preserving to the utmost in soundness and health this wonderful organ of complex powers with which our thoughts have been occupied. Follow out every natural provision for its exercise, its use, its rest. Avoid like poison all that needlessly irritates or stimulates it. And, whether in or out of health, remember the words of caution with which I started, and do not speculate about yourself nor dabble in physical matters for foolish curiosity's sake. Learn also to admire. "What a piece of work is man! how noble in reason! how infinite in faculty!" *Mirabilia sunt opera tua, et anima mea cognoscit nimis.*

There were fifty-three persons present.

MEETING HELD NOVEMBER 30TH.

Ornithology.

G. H. DAWSON exhibited specimens of the *Coot, Ring Ouzel, Hawfinch, Brambling,* and *Golden-crested Wren.*

The PRESIDENT read a letter from A. H. Glennie, asking for information about the song of the Crossbill.

Entomology.

A. MARSHALL noticed the capture by himself of the Winter Moth (*C. Brumata*) on Nov. 28.

The PRESIDENT exhibited two boxes of Brazilian Lepidoptera.

Archæology.

H. àCOURT exhibited a box of coins, among which were: a coin, probably a sextans, of Maximian, A.D. 286; a 10-reis of John V. of Portugal, A.D. 1743; a silver penny of one of the Edwards; a Chinese *cash,* value one-twelfth of a penny, composed of six parts of copper and one of lead; &c.

W. D. SMITH exhibited a Portuguese coin of Peter V., value 100 reis, equal to 6d; an Exeter halfpenny token, round the edge of which are the words "Payable at the warehouse of Samuel Kingdon," a shop which still exists; a silver two-penny piece of Henry VIII.

T. R. DUMERGUE exhibited Denarii of Diocletian, Faustina Augusta, Antoninus Pius, and Domitian, and shillings of Elizabeth, Edward VI., and James I., &c.

Botany.

E. IM THURN exhibited a specimen of *Tremella foliacea,* a fungus hitherto unobserved in the neighbourhood; also a collection of Swiss plants.

Zoology.

The PRESIDENT exhibited the skin of a Common Snake, which had measured 3 feet 10 inches in length, when alive.

Geology.

E. IM THURN exhibited a Madrepore, picked up near the Great Orme's Head.

C. A. Harrison read the following paper on

THE STRATIFICATION OF ROCKS.

I purpose this evening to speak on the Stratification of Rocks. I shall first speak generally of the different modes by which rocks are formed, and then show how these different formations appear in England.

There have been two great agencies in making the crust of the earth, namely, water and fire, and the rocks formed by their means are respectively called Aqueous and Igneous Rocks.

Aqueous, or as they are also called Fossiliferous Rocks, because they alone have fossils, are more widely spread over the earth than any other. Now the question is, how were they formed? Everyone knows how the rain after falling forms brooks, the brooks become rivers, and how very rarely rivers are clear. Now this muddiness arises from the fact that every river holds in suspension a great deal of sediment which has been derived from the waste of the land through which it passes. When this sediment is carried out to sea, it is deposited at the bottom, and by gradual accumulation forms what geologists call *strata*. This is the general form of stratification. The Nile is a most interesting instance of this: that river overflows once a year, and the thin layer of mud deposited differs slightly in colour from that of a previous year, and by different measurements it has been calculated that the average deposit in a century is about five inches. Pits have been dug in the Delta of the Nile, to the depth of 60 feet, without going through any other material than Nile mud, so we may say that the Nile Delta is some 150 centuries old at least, if we suppose the same agencies to have always acted as they do now. This statement may prepare you for the vast periods Geology requires for the formation of different beds.

You must remember, too, that while rivers are forming beds by their deposits of mud, &c., they are taking all this mud and stuff from something else: and so whenever we see a huge mass of mechanically formed aqueous rock we must feel sure that a gap has been made somewhere on the earth equal to the contents of the rock. I have mentioned rivers as one of these removing, or, as Geologists call it, denuding causes. Another, and the greatest, is the sea. Anyone who has lived long in the same place on the sea coast, will have noticed how very much the cliffs are worn away every year by the action of the sea, and indeed made to have quite different forms, and how every year the sea steals more land. Geologists say that the only agent to which the destruction and removal of masses of rock, notwithstanding their being many thousand feet thick, and hundred thousand square miles broad is owing, is the slow, gradual gnawing of the sea breakers upon coasts.

By this gradual gnawing of the sea and rivers the great vallies are formed, and consequently mountains, which are formed by the material taken away from the valley; but you can generally tell what has been denuded by sea and what by river. The sea, acting with a broader wide-spread action, rounds off the tops of hills, &c., like our downs, while the river cuts through a comparatively narrow line of ground, and tends to make the surface uneven, and to wear it into deep, rugged valleys. One more aqueous agency there is of great importance, and that is *glaciers*. Whenever a glacier passes over any solid rocks, the rocks in that valley become smoothed and polished, and present a wavy surface; and this comes to pass in this way: every glacier is traversed by cracks called "crevasses." Now the mountain peaks above the glacier are sometimes so steep that snow will not lie on them, and consequently they become crumbly through the influence of the air, &c., and tumble down on to the glaciers: these masses are called moraine stones, and generally make a line down the middle and along each side of the glacier. By degrees some of these large stones fall into the crevasses, and so are kept tight between the ice of the glacier and the rocks over which the glacier is moving, and so the result is that however hard the rock is these glaciers smooth them like glass, and not only does the rock get polished, but the moraine stones as well. The markings made by the slow scraping of these stones are quite different from those made by water or by torrents, as the stones, fixed firmly in the ice, and pushed along by it under great pressure, scoop out long rectilinear furrows or grooves parallel to each other. With glaciers may be classed icebergs. Suppose the sea to freeze at the base of some cliff; fragments fall on to the ice, the tide washes over these fragments, the water becomes frozen, and the blocks of stone are in this way locked up in the ice. The ice, when Spring comes, breaks up, and huge icebergs with these stones in them go floating about; these are carried into warmer latitudes, or the Gulf Stream, and there melt gradually away, and so unloose the stones in them, which of course sink to the bottom; or else they are driven on to the shore, where they leave their passengers. It is only in these ways (viz., glaciers and icebergs) that geologists can explain the existence of large boulders in places where they have no right to be when the material around is examined, and it is probable, though it is still a matter of doubt, that the stones in the Valley of Stones on the Bath Road, or in the glen of the Devil's Den, came there in this manner.

I shall now turn to the Igneous Rocks. Respecting igneous rocks, there is no satisfactory theory, some geologists ascribing all igneous phenomena to some *great central source of heat* in the centre of the globe. Others account for their production by chemical unions among the primary constituents of the rocky crust. These two theories are called Mechanical and Chemical. The three principal igneous rocks are *Granite*, *Lava*, and *Trap*; Granite (*granum*, because a compound of distinct grains and crystals) is found at the base of all rock, and is supposed to be lava, which has been hardened under vast pressure. Lava, as you know, is the molten material thrown up by volcanoes, and spreads over other strata, and this is the difference between granite and lava:—Granite is at the base, lava on the surface of rocks. Trap, a word derived from the Swedish *trappa* a stair, so called from the step-like appearance it gives to the hills composed of it, partakes sometimes of the nature of granite, sometimes of lava.

There are, then, two active powers at work even now in forming the crust of the earth—water and fire. Water by the agencies sea, rivers, and ice; fire by volcanoes and gradual upheaval in the subterranean depths of the earth. The Aqueous rocks generally, if not always, contain fossil remains, the Igneous never, because they have been under the influence of fire and all remains have been burnt out.

To apply these remarks to England. England has been called the Paradise of Geologists, and with very good reason, for very few geological formations are absent. The different strata appear in very marked ways:—Taking a line down from about the River Tees to the River Exe, we shall find that to the west of that line all the Primary or Palæozoic rocks appear and the Secondary rocks to the east of it. The Tertiary are generally in basins, of which the chief are the London basin, the Hampshire basin, and the Isle of Wight basin. Again the primary rocks in Wales are higher than the other formations in England, and supposing a journey were taken from Dover to the Menai Straits, it would be found to have a gradual ascent all the way, till the highest point was reached in Snowdon. Of course there are down hills and declivities, but these are generally owing to denudation. Another circumstance worth noting is that all the strata slope the same way from west to east, showing that the sea washed over them in that direction. I intend to go through this list of rocks, stating some of the peculiarities, as well as the animals and shells, and flora peculiar to each, specimens of which I will send round. But first I will show the general features in the large classes. In the Igneous rocks, as I said before there are no organic remains, or remains of any life, whence one of their names—Azoic, (*i.e.*, without life). The 2nd, Palæozoic, old life period, contain few or no fossil plants, or remains of any higher animals than crustacea, shellfish, and zoophytes.—Mesozoic, middle life epoch, contain fossil plants and animals of species totally different from those now existing. Cainozoic, recent life, contain the remains of plants and animals of species not very different in character from those we now have. (*Specimens of the different strata were then passed round for exhibition*).

The Lias is very rich in remains of ancient life, it is in this strata that the reptiles Ichthyosaurus and Plesiosaurus are found, besides great numbers of shells, particularly Ammonites; in fact at Whitby, where the Lias is the formation, the Ammonites are so plentiful that there is a legend that they were once all snakes, which infected Whitby, and annoyed the good citizens, but St. Hilda, the patron saint of the place, after whom the Abbey at Whitby is named, by a miracle prayed off the heads of the snakes and prayed them into stones, and what we call Ammonites are according to the legend only petrified headless snakes.*

The Oolite, so called from the great resemblance of the material to the roe of a fish, looking just like a number of very small eggs packed very close together.

Then come the Wealden Beds, which are very interesting, as they are of fresh water formation, and represent the Delta of a huge river, which may have been quite as large as the Ganges or Mississippi, and drained a large continent equal to Asia or North America, of which England formed but a very small portion. In fact you must not think that England was always an island; it has only become so quite recently, geologically speaking, and the way we know that it was once joined to Europe is this :—the same beds occur on either side of the English Channel, for instance, there are chalk cliffs at Calais and at Dover, and in all probability the land has been divided by the sea washing its way through. To return to the Wealden. I said it was a fresh water formation, and the mouth of some huge river, you might naturally ask, how do they know all this? the answer is, partly by the strata, but chiefly by the remains of Crocodilian reptiles, and shells, whose names I need not give, but which you would find any day on the banks of a canal or river. The Weald at length was submerged in the sea, and on it were formed the chalk series to the depth of from one thousand to twelve hundred feet. I will not go into the Tertiaries and post Tertiaries because I am afraid I have given you more than enough hard names to remember, but they are generally gravels, raised beaches, and deposits in Caves and different sorts of Clay. I hope I have now shown you what are the larger formations in England, I will now try to show what part these formations play in making the scenery of the country.

Whenever you see very hilly country and ragged scenery you may generally suppose that there are either igneous rocks or some of the primaries. Take for instance Wales and Scotland, in the former the Silurian, in the latter Gneiss and Granite are the prevailing Strata. Secondly, when you see beautifully rounded hills, as the downs you may generally know that the sea has at some period covered that part of the country, and moulded it into that shape.

I will conclude with a few words on the history of geology. There has been really no established history till 1790, though there have been numerous writers from B.C. 535, the date of Xenophanes, whom we know by the well-known example "Xenophanes ait lunam habitari," but they have written more on mineralogy than on fossils, and have indulged in theories rather than observation. However, in 1790 a surveyor called William Smith, who had no advantage of wealth, station, or college education, by dint of unwearied observation, arrived at results similar to those obtained by the continental geologists, namely the discovery that the order of the succession of different groups was never inverted, and that they might be identified at very distant localities by their characteristic fossils. He then published his "Tabular View of the Strata," in 1790, and afterwards, unaided, almost unnoticed and unknown, he pursued a series of investigations, which ended in the publication of his Geological Map of England, to which a celebrated continental geologist paid a high and just compliment, saying that what many celebrated mineralogists had only accomplished for a small part of Germany during half a century had been done by a single individual for the whole of England. You see then what any one may do in geology without assistance, and any one of us can by careful observation perhaps add to the science of geology, and I trust the Natural History Society will be able, some day or other, to contribute its share in the work.

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* This legend is recorded by Scott in Marmion :—
And how the nuns of Whitby told,
How of countless snakes each one
Was changed into a coil of stone,
When holy Hilda prayed.
Themselves within their sacred bound
Their stony folds had often found.

There were forty-four persons present.

MEETING HELD DECEMBER 15TH.

In consequence of the Examination, there were no reports from the heads of the different Sections, and but few objects exhibited.

A magnificent collection of British Sea-weeds, presented to the Society by Mrs. Gray, of the British Museum, was passed round, and thanks ordered to be given to the Donor.

E. IM THURN exhibited specimens of the Water Rail, Kestrel, and Tern, which latter he presented to the Society.

The following summary of proceedings was then read:—

	1866	Corresponding half 1865
Number of Meetings	7	8
Average No. of Members present	26	23
„ Visitors „	24	21
Total No. of Exhibitions	100	116
Collections exhibited	23	12
Average No. of Exhibitions per Meeting	14·2	14·4

The **Rev. J. J. PULLEINE** then read a paper, illustrated by numerous diagrams, specimens, and microscopic objects, on

TREES.*

My subject offers a very large field, one which it would be impossible to traverse in a short paper like the present. I might have spoken of the general distribution of trees throughout the globe, and contrasted the palms and tree-ferns of warmer climates with the forms with which we are acquainted; or the gorgeous crimson and scarlet flowers of the trees of the Island of Ceylon with the insignificant blossoms, unnoticed except by botanical eyes, of the forest-trees of our Island. I might have confined myself to the history of English forests and forest-trees, and made my paper half botanical, and half, so to speak, archæological. It would have been interesting to have spoken of the changes in the uses and value of various trees in England,—of the time, for instance, when oaks were valued more for the acorns which fed the swine† than for the timber which until these days of Warriors and Monitors furnished the wooden walls of our Island; or again, I might have told the history of yews, how once they were carefully cultivated and guarded with all the jealousy of the law, as the producers of the dreaded English long-bow—the conqueror of Cressy, of Poictiers, and of Agincourt—and how afterwards they were doomed in the days of Dutch gardens to be pinched and clipped into every shape under the sun. Many such gardens still exist. At Levens Park, near Kendal, the trees have been made to represent various forms of helmets. The history of the larch, again, now one of the most useful of our timber trees, is very interesting. It was imported as an ornamental tree about 200 years ago, and was considered a rarity, until, about the middle of the last century, the Duke of Athol commenced planting them by thousands on his Scotch estates.

But I must hurry on, only just stopping to remind you that coal measures are the remains of vast forests which thrived and flourished thousands upon thousands of years ago, and that many fossil trees are still found in them which mark for us the vegetation of the pre-historic periods.

We in England are justly proud of our trees, and we can fully appreciate their utility, and partly their beauty and durability: but we can form very imperfect notions of the size to which trees are capable of attaining. Our largest English trees fade into insignificance when contrasted with those of tropical regions, where heat and moisture combine to stimulate to the utmost their growing powers. The Baobab trees of Senegal in Africa are said to have occasionally a girth of 90 feet, and specimens of *Wellingtonia gigantea* have reached a height of 400 feet, whilst the famous Banyan, or Indian fig-tree of India covers with its shade an almost inconceivable area. This last species throws out roots from its branches, which in time reach the ground, and act as props to the parent tree. A specimen growing on the banks of the Nerbudda * is believed to be identical with one which in the time of Alexander the Great was said to be capable of sheltering 10,000 men. Some of its many stems have been carried away by floods, so that it can now shelter no more than 700, but its chief trunks—thicker than those of our English trees—still number 350, whilst the smaller stems amount to more than 1,000.

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* I beg to offer my most sincere thanks to the Rev. T. A. Preston for the assistance he has given me in preparing this paper, and especially for the loan of diagrams, and of a very valuable collection of British and foreign woods.

† Selby's "Forest Trees," p. 257.

The age of some of our English trees is very great. There are still, or were lately in existence, oaks and chesnuts which were known as old trees in the time of the Conqueror, and at Fountains Abbey there is a solitary yew—the last of seven—which is said to have afforded shelter to the monks of Fountains, when the abbey was building in the 12th century. Balfour mentions a yew at Hedsor, in Buckinghamshire, supposed to be 3,000 years old, but the patriarch of the whole race of trees is the Baobab above mentioned, specimens of which are said to be 5,000 years old.

So much by way of preface. What I propose to do to-night is, to give a short account of the different forms of the stems of trees, and to explain how wood is formed. After this, if time allows, I should like to say a few words on the functions of the different organs of the tree.

But before I speak of stems, it will be necessary to explain of what wood consists. All plants are composed of two kinds of tissue, *cellular* and *vascular*. It is by the union of these tissues that the organs are formed, by which all the functions of plants are carried on. *Cellular tissue* consists of a large number of very minute bladders or cells. These cells, though not visible to the naked eye, assume an immense variety of shapes, all of which have been named by vegetable physiologists. I will try to introduce as few technical terms as possible into my paper to-night, because there are many here to whom this subject is a new one. But it must be borne in mind that in all scientific subjects an accurate nomenclature is of absolute necessity for purposes of classification, and must be thoroughly mastered by any one who is really pursuing natural science for its own sake. The object, I take it, of the papers which are read before this Society (where each member is or ought to be devoting himself to some special line), is that they should, whilst containing something that is interesting to all, give an outline which may be filled in by those who take a special interest in the subject before them—that they should, in fact, be suggestive, rather than exhaustive, and guides to science, rather than scientific in themselves.

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* See Heber's Travels in India, iii. 67. Milton refers to this tree in "Paradise Lost. Bk. ix. 1100 sqq.

But to return from this digression. I was speaking of the various forms which the bladders of the cellular tissue assume. They are sometimes conical, as in hairs, others are cylindrical, fusiform or spindle-shaped, stellate or star-shaped, and prismatical. These last are especially interesting to us, as it is these when compressed which form the *medullary rays*, of which I shall shortly speak. Sometimes the coating of the cell has the appearance of being pitted, sometimes a spiral fibre is coiled up within. The most familiar instance of cellular tissue which can be named is Cotton.

Vascular tissue is formed of long tubes, of which there are many varieties, but I shall confine myself to speaking of the *woody fibre*. In this the tubes are spindle-shaped. Their coatings become hardened by a succession of deposits or incrustations of matter, and it is of these that the wood of trees is formed. In hemp and flax the woody fibre is very easily distinguished. The markings upon this woody fibre are generally indefinite, but in the case of Coniferæ they are stamped out with exceedingly minute circles, as though by a die. This form of tissue is called punctated. Such then are the elements of which wood consists. I now proceed to the examination of the stems of trees.

There are three forms of stems :—

1. Exogenous or Dicotyledonous.
2. Endogenous or Monocotyledonous.
3. Acrogenous or Acotyledonous.

As all our British trees and all timber trees are Exogenous, I shall devote the chief part of my paper to them. First, however, it will be desirable to point out the chief points of difference in the three kinds of stems.

1. The chief characteristics then of Exogenous stems are as follows:— They increase by forming fresh layers of wood *externally* to the old layers. The bark can easily be separated from the trunk. The annual growth is marked by distinct concentric rings, and they contain in the centre a canal containing pith, which is connected with the bark by thin rays of cellular tissue, called medullary rays. The natural result of this mode of growth is that the wood is most solid at the centre, the solidity diminishing towards the circumference.

2. Monocotyledonous stems have no separable bark—no annual rings, and no distinct pith. Instead of growing more solid towards the centre, they are hardest towards the exterior—the centre being frequently hollow. The name of endogenous was given them from an idea that the newest fibres were nearer to the centre than the old, but it has since been discovered that the fibres cross one another before passing into the leaves. There is no distinction between pith, wood, and bark. Bundles of vascular tissue are scattered throughout the cellular tissue, and accordingly a section of the stem will show neither annular rings nor medullary rays. The most familiar instance of a monocotyledonous stem is the cane. In England the butcher's broom *(Ruscus*

aculeatus) is the only monocotyledonous plant of any size. Sections of palm wood show the formation well. Monocotyledons are short-lived in comparison with Dicotyledons, the cellular tissue in time ceasing to convey nourishment. The leaves are produced from a central terminal bud.

3. Tree-ferns have Acrogenous stems, *i.e.*, stems which are increased by additions at the summit. The vascular bundles form an irregular circle round the exterior. The bark, if it may be so called, is formed by the bases of the leaves. In a young state the stem is solid, but frequently becomes hollow by the rupture of the walls of the cells in the centre. The stems of tree-ferns sometimes reach the height of 120 feet.

Let us now trace the growth of an exogenous stem. Suppose an acorn or the seed of any other dicotyledonous plant to have fallen in the ordinary course of nature into the ground. The embryo, after remaining in a state of torpor, it may be for one, or two, or many years, at length bursts its sheath, and two small root-leaves, or cotyledons, appear above ground, just as we see them in turnips or radishes. Between them is a small bud or plumule, from which are produced the true leaves. What is the formation of the young stem? If we take a section of one we shall find at first a mass of *pith*, which is formed entirely of cellular tissue: around this a ring of ducts and vessels called the *medullary sheath*, and over this a coat, called the epidermis. By degrees the spindle-shaped woody fibre is produced, and a further development of cellular tissue takes place between the medullary sheath and the epidermis, or outer covering, whence are produced two layers, the vascular tissue forming a layer of wood, the cellular, of bark. This is the state of the young stem at the end of the first year. During the second year a half-fluid matter, called *cambium*, appears between the wood and the bark, which gradually becomes organized, and separates into two layers, of the same kind as before. Thus the first ring of bark is gradually pushed outwards. This process is repeated—a fresh layer of wood and a fresh layer of bark every year. With the growth of the tree, the external layer of bark is strained and cracked, whence its rugged appearance. The woody fibre in the meanwhile continues to increase, wedging itself in, as it were; circumscribing the pith in the centre, and compressing that which surrounds it, until the connection between the pith and the bark consists merely of narrow streaks, which, by continual pressure, become the hardest portion of the wood. These streaks are termed medullary rays. Their principal object seems to be to keep an open passage for the sap, by resisting the pressure of the annual rings. The stem, then, is formed of two distinct tissues, of which the pith, the medullary rays, and the bark are *cellular*, and the remainder *vascular*. We may compare the stem of a tree roughly to a wheel, the wood-work representing the cellular tissue, and the spaces between the spokes the vascular tissue.

Having now traced the growth of a tree for two years, let us pass over, say half a century, and take a fresh section. We shall find *four* principal divisions—the pith, the heart-wood, the sap-wood, the bark.

The *pith* in general takes up very little space. Originally containing a considerable proportion of water, it nourishes the plant when young, but afterwards withers up, or is entirely absorbed.

In the last three divisions we observe a number of concentric rings, which generally mark the growth of each year, although any sudden stimulus is sufficient to add a ring. By these, as you all know, the age of a tree can be determined, at any rate within a few years. To shew the regularity with which the rings are formed, I have received from a very reliable source an account of some larch trees, planted in 1747 or 1748, and cut down in 1832. "Six," says my informant, "were examined by me, and each of them had 83 rings." And these rings not only give the age of the tree, but likewise its history. In Sherwood Forest some old trees were cut down, inside the wood of several of which were found letters marking the reigns of various kings: thus nine inches inside one tree were found the initials "W. M." for William and Mary, with a crown above them; and 18 inches within another, the letter I, with a crown, for King John. For calculations respecting the age of these trees, a reference may be made to "The Beauties of England and Wales." The history of the climate is also recorded: thus in a moist year a broad ring will be formed; in a dry year, a narrow one. Moreover Decandolle, in examining an old Juniper tree which had been cut down in the Jardin des Plantes, discovered some black spots on various rings. By counting he found that severe frosts had occurred in the years when the marked rings had been formed. The rings are often broader on one side of the tree than the other. Two reasons may be given for this—either the tree has been exposed to some prevailing wind, which has checked its growth, or the roots have been more vigorous on one side than the other. It is very interesting, too, to observe how, where a branch has been cut off, the annual rings, which had before had two centres, will work their way round the lopped branch, and envelope it within its folds. In tropical countries, where vegetation receives no periodical check, like our winter, the annual rings occasionally cannot be distinguished.

How is it that the wood grows hard? There is always a well marked line between the sap-wood and the heart-wood. The sap in its passage through the stem leaves a deposit, which by degrees fills up the channel altogether, and the wood becomes close compact and durable. The durability of some woods, especially of oak timber, is very remarkable. Two specimens of old oak have been lent me, one, a portion of the Rose Blanche, a vessel built by Henry VIII., cut in 1510, and which lay submerged 320 years; the other, a piece of oak from York Minster, which was cut in 1364, which, after five centuries' wear, seems as strong as ever. There is also an account of an immense oak beam, which was discovered in good preservation in demolishing some old buildings in Paris, upon which was carved an inscription to the effect that it had been placed there in 1450, and was 600 years old when cut in the Forest of Rovray—a portion of which is now occupied by the Bois de Boulogne.

Timber also varies immensely both in weight and hardness. Take in your hand, for instance, a piece of Quassia Wood (Jamaica), or pencil cedar, or, lighter still, of Cork Wood (Dominica), and a piece of ebony of about the same bulk—the difference is astonishing. The hardest wood, perhaps, is Cam Wood (Africa).

I now come to the question of the circulation of the sap. I can only detail to you the experiments which were made some years ago by Knight. First he removed a portion of bark, about half an inch in breadth from a number of trees. The result was that the stem and branches above the incision, communicating with the leaves through the bark increased as before, but below the incision the growth of the tree was at a standstill. It was plain, therefore, that the *upward* current of sap was not impeded by the incision, but the *downward return* current was. Hence it was concluded that it was the downward current which assisted the tree's growth. Moreover the direction of the current of sap was traced, by means of coloured infusions, running by one series of vessels up to the leaf, whilst another series returned a fluid in most cases colourless, out of the leaf. These tubes entered the bark, and apparently descended to the points of the roots.

The second experiment was the removal of the sap-wood, and then no vegetation whatever took place. Hence it is through the sap-wood that the crude sap ascends.

The entire removal of the bark, however, would soon have a very injurious effect on the tree. The tender wood from exposure to the weather would shrink and prevent the sap from rising, and so the vigour of the tree would be greatly impaired. Thus in some parts of Savernake Forest—there are fine beeches which this year had not a tenth part of their compliment of leaves—the rabbits in the severe weather having gnawed away the bark all round the trunk.

It is then when descending, that the sap forms the new layer of sap-wood. The amount of sap-wood in different trees varies considerably. Thus the yew has about 30 rings of sap-wood. Memel fir 44, and red Canada pine as many as from 80 to 100. In marshy soils the quantity of sap-wood and bark is very large in proportion to the heart-wood.

Having thus given a sketch of the different parts of the stem and their uses—there are two more subjects which must not be omitted, viz.:—The buds and branches, and the roots of trees.

Buds **are formed wherever leaves appear, though occasionally they are found where leaves do not appear, when they are called *adventitious*. They are either terminal, that is produced at the end of the branch, or *lateral*, produced at its side. Many buds, however, prove abortive, or at any rate remain dormant—sometimes for many years. They are carried outwards with the growth of a tree, and are ready to burst forth should any injury arrest the growth of the terminal bud. This is the theory upon which the custom of pollarding trees is founded. In a pollarded tree the sudden growth of twigs is not a collection of branches newly born, but of dormant branches whose vitality has been once more awakened by lopping off the leading branch. These abortive buds occasionally take very curious forms—the balls of twigs which we see in birch trees are produced in the manner above described. Sometimes the abortive buds swell out in large lumps upon the stem, giving it a gouty appearance, as in the * Wen Oak of Savernake Forest, and excrescences are sometimes formed of large size, which detach themselves from the trunk entirely.**

The *root* is analogous in structure to the stem, as it descends into the ground, giving off small branches—at the extremities of which the cellular tissues instead of being covered with an epidermis like the rest of the plant, is exposed. The organs which absorb the nutriment of the tree are called spongioles.

The development of roots, however, is not entirely confined to the lower part of the tree. Some Parasitic plants possess only aerial roots—which absorb their food in the state of vapour—and certain tropical trees are in the habit of developing aerial roots which gradually descend to the ground, and become props as in the case of the Banyan Tree. In the case of the Mangrove Tree, which grows at the mouths of muddy tropical rivers, the roots are formed before the seed drops from the tree, and adventitious roots are also formed which give the tree the appearance of walking on stilts. The screw pine, a native of the Indian Islands, also sends out adventitious roots in a regular spiral order. In course of time the original stock and the elder roots decay, and the tree is entirely supported by these adventitious roots.

There is a theory that every bud is a perfect plant on a small scale, with both an ascending and a descending axis. Certainly the production of roots by the screw pine seems in favour of this view. The distinction between the root and the stem is that the former does not produce leaf-buds.

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* It may be worth mentioning the origin of the names of the other two famous oaks in Savernake Forest—the Duke's Vaunt, and the King Oak. The former is said to have been the favourite tree of the Protector Somerset—the latter is said to have been so called after George I.—not, as is generally supposed, after Henry VIII.

Ash-trees are sometimes found which have grown on pollard willows, and struck through the decaying stem into the ground. These roots become covered with green bark, like the stems of other trees. Moreover, in very aged and hollow trees, especially in yews, we sometimes find a root like a pillar supporting the roof, as it were, of the cave which the tree has formed. There is one at Fountain's Abbey, supporting the last of the aged yews for which the Abbey is famous, and another at the village of (*) Thornton Steward, near Bedale, Yorkshire. They are covered with a coating of bark, and would be at any time taken for *bona fide* stems. This effort of a tree in supplying supporting columns to save itself is very remarkable. The probable origin of the stems is as follows:—† When the top of the trunk has begun to rot from the combined effects of age and weather, a rich mould is formed. Into this a dormant bud suddenly strikes, and the root gradually works its way downwards through the rotting heart of the tree, until it reaches the ground. Meanwhile the decay reaches the bark, and a rift is made in the stem. The rotten timber-wood falls out, and the new root is seen in the form of a stem, firmly established in the ground. It is just possible that the prop may be actually a fresh seedling tree, which has vegetated in the same way as the ash-trees above mentioned. There is also, in "Selby's Forest Trees," an account of a yew-tree, in Worcestershire, growing out of a hollow pollard oak, in which case the seed must have been deposited in the decaying top of the oak, and gradually worked its way downwards to the ground in the manner above described.

The subject, to be fully treated, would require a much longer time than we can be allowed here. One point—the leaves of trees, which serve the same purpose as the lungs of the animal frame—I have purposely omitted, as requiring a more minute consideration than could be given to it in a general paper like this. I hope at some future period to be able to continue the subject, being as it is full of interest, not merely to botanists, but to everyone who cares about nature at all, for whether we look at their beauty, or their enduring strength, or their wide usefulness, in each and every way, we cannot but feel that they are among the greatest of the Creator's gifts to man. Perhaps I may be excused for quoting, in conclusion, those famous lines from the Faerie Queene:—

> "And foorth they passe with pleasure forward led,
> Joying to heare the birde's sweet harmony,
> Which therein shrouded from the tempests dred,
> Seemed in their song to scorn the cruell sky.

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* I have to thank the Rev. A. Fitch, of Thornton Steward, for many valuable suggestions while writing this paper.

† See Selby's Forest Trees, p. 377.

Much can they praise the trees, so straight and hy,
The sayling pine, the cedar proud and tall,
The vine-propp elme, the poplar, never dry,
The builder oake, sole king of forrests all,
The aspine good for staves, the cypresse funerall.

The laurell, meed of mightie conquerours
And poets sage; the firre that weepeth still,
The willowe, worne of forlorn paramoures,
The eugh, obedient to the bender's will,
The birche for shaftes, the sallow for the mill,
The mirrhe sweet-bleeding in the bitter wound,
The warlike beech, the ash for nothing ill.
The fruitful olive, and the platane round,
The carver holme, the maple seldom inward sound.

There were thirty-four persons present.

ENTOMOLOGY.

As with Botany, so with Entomology, the wet September put an early termination to our collecting—hence, the list is not so long as could be wished. Several new species have, however, been added to the list, many of them by C. M. Bull, Esq., whose able assistance we hope to receive for the future.

Names of those whose initials occur in the list:—

F. F. B.	F. F. Back.
H. B.	Rev. H. Bell.
R. H. B.	R. H. Brown.
C. M. B.	C. M. Bull, Esq.
W. W. D.	W. W. Dayman.
A. C. H.	A. C. Hilton.
H. M. H.	H. M. Hilton.
F. J. H. J.	F. J. H. Jenkinson.
F. P. M.	F. P. Mansfield.
A. M.	A. Marshall.
J. C. P.	J. C. Palmer.
C. E. P.	C. E. Powell.
J. J. P.	Rev. J. J. Pulleine.
T. T.	T. Tilleard.
E. H. W.	E. H. Wayman.

LEPIDOPTERA.

Gonepteryx Rhamni	*Brimstone*, September 2, *R. H. B.*	
Hipparchia Janira	*Meadow Brown*, last specimen observed Sept. 30.	
Vanessa Atalanta	*Red Admiral*, Sept. 9, — *Tweedale.*	
Thecla Quercus	*Purple Hairstreak*, taken in West Woods, Aug. 23, by *C. E. P.*, *H. M. H.*, *A. C. H.*, and *F. J. H. J.*	
Smerinthus Ocellatus	*Eyed Hawk*	Several larvæ taken during September.
S. Populi	*Poplar Hawk*	
S. Tiliæ	*Lime Hawk*	
Acherontia Atropos	*Death's Head.* Four Larvæ, taken near the College Sanatorium. One, found by *C. E. P.*, was fed for some time on Privet, there being no Potatoes obtainable.	
Sphinx Ligustri	*Privet Hawk.* Several Larvæ taken. One from ash, by *J. C. P.*, near the Workhouse.	

Hepialus Sylvinus	*Orange Swift.* Taken near the College, Aug. 26, *H. M. H.*
Cerura Vinula	*Puss Moth.* Larvæ taken at Manton Copse, August 22, *C.E. P.*, and *H. M. H.*
CERURA FURCULA	*Kitten.* Larva taken near the College Bathing Place, Aug 23, *W. W. D.*
Orgyia Antiqua	*Vapourer.* Oct. 3, *W.W.D.*; said to have been taken at the end of August by *F. J. H. J.*
Lithosia Complanula	August 28, — *Fasken.*
HYDRÆCIA MICACEA	September 7, *C. M. B.*
Heliophobus Popularis	September 2, *E. H. W.*
LUPERINA TESTACEA	August 18, *W. W. D.*, Plentiful at Light.
AGROTIS SUFFUSA	October 2, *C. E. P.*, at Light.
TRIPHÆNA JANTHINA	August 20, *A. M.*; August 26, — *Churchill.*
T. Fimbria	August 26, — *Churchill.*
T. Orbona	September 16, *J. C. P.*
NOCTUA C.-NIGRUM	September 7, *C. M. B.*; September 12, *T. T.*
N. Xanthographa	September 4, *J. J. P.*
ANTHOCELIS LUNOSA	September 9, *C. M. B.*
A. PISTACINA	October 3, *C. E. P.*
EPUNDA LICHENEA	September 16, *J. B. Oakeley.*
Plusia Chrysitis	August 24, *C. E. P.*
P. Gamma	A specimen in fine condition, Nov 17, *C. M. B.*
Amphipyra Pyramidea	September 5, *A. M.*
MANIA MAURA	August 28, *W. W. D.*
EPIONE APICIARIA	September 8, *W. W. D.*
Ennomos Tiliaria	September 9, *F. F. B.*
E. Angularia	August 23, *A. C. H.*
HIMERA PENNARIA	November 1, *H. B.*
Halia Wavaria	August 31.
Hibernia Progemmaria	December 5, *F. P. M.*
Cheimatobia Brumata	November 28, *A. M.*
EUPITHECIA RECTANGULATA	August 23, *F. J. H. J.*
Ypsipetes Elutata	August 22, *C. E. P.*, *A. C. H.*, and *H. M. H.*
PHIBALAPTERYX POLYGRAMMATA	Preshute, Sept 7: also at Light, Sep. 8, *W.W.D.*
Scotosia Dubitata	August 18, *W. W. D.*
S. CERTATA	August 27, *C. E. P.*
Pyralis Farinalis	Before September 5, *W. W. D.*
CRAMBUS GENICULEUS	Clatford, August 22, *H. M. H.*

BOTANICAL NOTICES.

The following list, though not so long as usual, presents several interesting features—the number of new localities and new species is unusually great. The reason of this is, that the cold, damp spring retarded vegetation, and consequently, on our return to Marlborough after the holidays, plants were not so far advanced as is usually the case. During August a great deal of work was done, but with September came a cold, damp period, which put a stop to botanizing. In October the weather was finer, but most plants were entirely destroyed, and but little could be done. In consequence of the "Calendar," published in this Report, these Botanical notices have been curtailed as much as possible, and only such observations are recorded as seemed necessary for *adding* to our previous knowledge of the Flora of Marlborough, all facts in confirmation of previous observations have been suppressed. Under these circumstances, the present list must be considered very encouraging, and exhibits a considerable step made in the right direction.

A. C. A.	A. C. Almack.
H. R. A.	H. R. Armstrong.
F. B.	F. Blackburn.
F. F. B.	F. F. Back.
A. D.	A. Dolben.
W. W. D.	W. W. Dayman.
A. H.	A. Herklots.
A. P. H.	A. P. Hockin.
H. M. H.	H. M. Hilton.
R. R. P. H.	R. R. P. Hilton.
H. A. J.	H. A. Johnston.
F. J. H. J.	F. J. H. Jenkinson.
A. M.	A. Marshall.
T. E. M.	T. E. Maclean.
F. P. M.	F. P. Mansfield.
J. J. P.	Rev. J. J. Pulleine.
J. W. P.	J. W. Parrington.
G. F. R.	G. F. Ruck.
H. S. S.	H. S. Sankey.
E. im T.	E. im Thurn.
T. T.	T. Tilleard.
E. H. W.	E. H. Wayman.

Clematis Vitalba	Traveller's Joy, near Crofton, *J. J. P.*
Ranunculus heterophyllus	Water Crowfoot, still in flower Aug. 23, *A.P.H.*
R. acris	Upright Crowfoot, flower Nov. 30, *E. im. T.*
Papaver Rhœas	Red Poppy, flower Nov. 17, *E. im T.*
Helianthemum vulgare	Rock Rose, flower Sept. 9, *A. H.*
Viola sylvatica (b)	Wood Violet, flower Oct. 24, *J. W. P.*
V. tricolor	Heartsease, flower Nov. 30, *E. im T.*
Polygala vulgaris	Milkwort, flower Sept. 24, *A. P. H.*
Saponaria officinalis	Soapwort, full flower Sept. 11, *T. T.*, *F. B.*, *A. D.*
Lychnis vespertina	White Campion, flower Oct. 21, *T. E. M.*
L. diurna	Red Campion, flower Dec. 5, *J. W. P.*
Stellaria graminea	Lesser Stitchwort, full flower Sept. 11.
Malva moschata	Musk Mallow, in flower till about Sept. 24.
M. sylvestris	Common Mallow, full flower Nov. 11, *H. A. J.*
M. rotundifolia	Dwarf Mallow, full flower Sept. 1, at Mildenhall.
Hypericum quadrangulum	St. Peter's-wort, flower Sept. 1, at Mildenhall, *E.H.W.*
H. perforatum	St. John's-wort, over by beginning of Sept.
H. humifusum	Trailing ditto, flower September 11, at Clench, *R.R.P.H.*
H. pulchrum	Upright ditto, in flower Sept. 11.
Æsculus Hippocastanum	Horse Chestnut, leafless Nov. 10.
Geranium pratense	Crowfoot Crane's-bill, nearly over by end of August.
G. dissectum	Dove's-foot, in flower in September.
G. Columbinum	Long-stalked Crane's-bill, corn-fields near Ivy's Farm, *A.C.A.*; in flower Oct. 24, *J.W.P.*
G. molle	Dove's-foot Crane's-bill, in flower during Aug.
G. Robertianum	Herb Robert, flower Nov. 30, *E. im T.*
Rhamnus Catharticus	Buckthorn, in a Pit near Clench.
Ulex nanus	Dwarf Furze, Clench, Sept. 24, *F.P.M.*; Nov. 30, *E. im T.*
Ononis arvensis	Rest Harrow, Forest Hill, Sept. 1, *R.R.P.H.*
O. campestris	Ditto, Mildenhall, Aug. 22; Avebury, Aug. 23.
Anthyllis vulneraria	Lady's Fingers, nearly over Aug. 18, *T.E.M.*
Vicia hirsuta	Hairy Tare, Aug. 30.
Agrimonia Eupatoria	Agrimony, full flower Aug. 18, *T.E.M.*
A. odorata	Martinsell, Aug. 30; Clench, Sept. 11.
Potentilla Tormentilla	Tormentil, in flower Aug. 31, *H.R.A.*
Fragaria vesca	Strawberry, flower Oct. 24, *J.W.P.*

Rubus cæsius	Dewberry, first fruit Aug. 24, *F.J.H.J.*
Rubus ?	Blackberry, first fruit Aug. 30, *R.R.P.H.*
Geum urbanum	Avens, flower Oct. 24, *J.W.P.*
EPILOBIUM ANGUSTIFOLIUM	Rose-bay, between Savernake House and Great Bedwyn—full flower Aug. 30, *J.J.P.*
E. hirsutum	Great Willow-herb, coming into flower Aug. 22.
E. parviflorum	Small Willow-herb, Martinsell, flower Aug. 30.
E. montanum	Broad Willow-herb, Martinsell, flower Aug. 30.
Spergula arvensis	Corn Spurrey—Avebury, full flower Aug. 23.
Sedum Telephium	Orpine, lane leading to Hillcott Mill, Sept. 7, *Greenwell.*
Pimpinella Saxifraga	Burnet Saxifrage, Nov. 30., *E. im T.*
Angelica sylvestris	Wild Angelica, in bud Oct. 24, *J.W.P.*
Pastinaca Sativa	Parsnep, full flower Aug. 22.
Heracleum Sphondylium	Hogweed, flower Oct. 25, *E. im T. & G.F.R.*
Torilis infesta	Corn Parsley, nearly over Aug. 30, Mildenhall and Clench.
Chærophyllum temulum	Rough Chervil, flower Nov. 4, *T.E.M. & H.A.J.*
Hedera Helix	Ivy, first flower Sep. 26, *G.F.R.*
Valeriana officinalis	Valerian, still in flower, Aug. 30.
Dipsacus sylvestris	Teasel, nearly over, Aug. 22. Rabley Aug. 27, *H.S.S.*
Scabiosa succisa	Devil's-bit, white variety, Sep. 21, *R.R.P.H.*
Eupatorium cannabinum	Hemp Agrimony, in flower Sept. 11.
Bellis perennis	Daisy, still in flower Dec. 14. *Glasse.*
Pulicaria dysenterica	Fleabane, coming into flower Aug. 22.
Bidens cernua	Bur Marigold, full flower, Sep. 1.
Chrysanthemum leucanthemum	Ox-eye, last flower observed Oct. 26.
C. SEGETUM	Corn Marigold, Barton Farm, Oct. 25, *E. im T.*
Matricaria inodora	Corn Chamomile, last flower observed Nov. 10, *J.W.P.*
Artemisia vulgaris	Mugwort, Pewsey-road, near Tan-coat lane; also on Forest-hill, by *R.R.P.H.*, and at Mildenhall, by *E.H.W.*
Tanacetum vulgare	Tansy, Tan-coat lane, full flower Aug. 30.
Gnaphalium uliginosum	Cudweed, full flower Sep. 21, *W.W.D.*
G. Sylvaticum	Highland Cudweed, Clench, full flower Sep. 11. *W.W.D.*
Senecio Jacobæa	Ragwort, going off about the middle of Aug.; flower as late as Nov. 11, *T.E.M. & H.A.J.*
S. aquaticus	Marsh Ragwort, flower as late as Nov. 4., *T.E.M.*

Serratula tinctoria	Saw-wort, full flower Aug. 22.
Carduus eriophorus	Woolly-headed Thistle, Pewsey-road, near Tancoat lane, full flower Aug. 24, *J.J.P.*
Apargia autumnalis	Autumnal Hawkbit, nearly over Oct. 26.
Tragopogon minor	Goat's-beard, Forest-hill, Sep. 1.
Leontodon Taraxacum	Dandelion, flower as late as Nov. 11, *T. E. M. & H.A.J.*
Sonchus oleraceus	Sow-thistle, Preshute, Sep. 8.
S. asper	Sow-thistle, as late as Nov. 11, *A.M.*
S. arvensis	Corn Sow-thistle, plentiful on the railway banks, and at Avebury.
Crepis virens	Smooth Hawk's-beard, flower as late as Oct. 26.
Hieracium vulgatum.	Wood Hawkweed, Manton Copse.
H. boreale	Shrubby Hawkweed, Martinsell, Aug. 30. *T.E.M.*
PHYTEUMA ORBICULARE	Avebury, nearly over Aug. 23.
Campanula glomerata	Clustered Bell-flower, flower as late as Nov. 5.
C. TRACHELIUM	Nettled-leaved Bell-flower, Forest-hill, Sep. 1.
Calluna vulgaris	Ling, full flower Aug. 18, *T.E.M.*, occurs at Row Down, *T.E.M.*, Martinsell, *R.R.P.H.*, and at Avebury.
Fraxinus excelsior	Ash, almost entirely leafless Nov. 10.
*Syringa vulgaris	Lilac, mostly leafless, Nov. 10.
Erythræa Centaurium	Centaury, generally over by Sep. 11, flower as late as Oct. 24, *J.W.P.*
Gentiana amarella	Felwort, in perfection during September; over by Nov. 5; white varieties found by *G.F.R.*, *H.M.H.*, and *R.R.P.H.*
G. campestris	Field Gentian, plentiful at Clench; Marlborough Common, *H.R.A.*—during September.
Symphytum officinale	Comfrey, in flower during September; flower as late as Nov. 4, *T.E.M.* and *H.A.J.*
Verbascum Thapsus	Mullein, flower as late as Oct. 21, *E. im T.*; a specimen 6½ feet high, Sept. 21, *R.R.P.H.*
Linaria vulgaris	Yellow Toad-flax, full flower during August. A specimen, approaching the Monstrosity, called Peloria, found on Forest Hill, Sept. 1, by *R.R.P.H.*
Scrophularia aquatica	Water Betony, flower as late as Nov. 27, *G.F.R.*
Melampyrum pratense	Cow-wheat, in perfection during August.
Pedicularis sylvatica	Red Rattle, flower as late as Sept. 24, *A.P.H.*

Euphrasia officinalis	Eye-bright, plentiful during September.
Veronica chamædrys	Germander Speedwell, flower Oct. 21, *T.E.M.* and *H.A.J.*
V. serpyllifolia	Thyme-leaved Speedwell, flower Oct. 24, *A.P.H.*
Mentha rotundifolia	Round-leaved Mint, not long in flower, Aug. 30.
Lycopus europœus	Gipsy-wort, Mildenhall, going off Aug. 22.
Calamintha Clinopodium	Wild Basil, going off Aug. 18, flower as late as Oct. 28, *F.F.B.*
Prunella vulgaris	Self-heal, over by Aug. 18, *T. E. M.*
Nepeta Glechoma	Ground Ivy, flower Oct. 21, *T.E.M.* and *H.A.J.*
Lamium purpureum	Red Dead-nettle, flower Nov. 25, *T. E. M.* and *H. A. J.*
L. album	White Dead-nettle, flower Nov. 11 (plentiful), *T. E. M.* and *H. A. J.*
Stachys sylvatica	Hedge Woundwort, in perfection during Aug.; a monstrosity with a green lip found near the Workhouse, October 24, by *G. F. R.*
Verbena officinalis	Vervain, Mildenhall, full flower September 1, *E.H.W.*; Bath Road, Sept. 9, *H.M.H.*
Primula vulgaris	Primrose, coming into flower Oct. 24 and 25, *J. W. P.*, *G. F. R.*, and *E. im T.*
Lysimachia Nummularia	Moneywort, flower, Mildenhall, Sept. 1.
Anagallis arvensis	Scarlet Pimpernel, flower Oct. 24, *J. W. P.*
Polygonum Persicaria	Spotted Persicaria, in flower during October.
P. MINUS	Clench, flower Aug. 30, *R. R. P. H.*
Ulmus suberosa	Common Elm, leafless by Nov. 11.
U. montana	Wych Elm, about a week or 10 days later.
Populus nigra	Black Poplar, leafless Nov. 11.
Habenaria viridis	Frog Orchis, Rabley, Sept. 21, *W. W. D.*
SPIRANTHES AUTUMNALIS	Lady's Tresses, fields between Wan's-Dyke and Clench, Sept. 10, *W. W. D.*; also at Sergeant Doole's, *J. J. P.*
Allium vineale	Crow Garlick, near Cadley, *J. J. P.*
Colchicum autumnale	Meadow Saffron, flower August 31, *Mrs. Blake.*
Juncus effusus	Soft Rush, at Clench and Mildenhall, Aug. 30 and Sept. 1.
J. CONGLOMERATUS	Mildenhall, Aug. 22.
J. lamprocarpus	Jointed Rush, Mildenhall, Aug. 25.
J. bufonius	Toad Rush, Mildenhall, Aug. 25.
Alisma Plantago	Water Plantain, coming into flower Aug. 22.

TRIGLOCHIN PALUSTRE ...	Arrow-grass, Mildenhall, in 2 places, Aug. 25.
Potamogeton crispus ...	Frog's Lettuce, Clench.
SCIRPUS LACUSTRIS... ...	Bulrush, Mildenhall.
Phragmites communis ...	Common Reed, full flower Sept. 1.
Sclerochloa rigida	Hard Meadow Grass, Forest Hill, *H. R. A.*
Equisetum palustre ...	Marsh Horse-tail, Mildenhall.
Athyrium Filix-fœmina ...	Lady-Fern, Wan's-Dyke at Clench, also the variety *rubricaulis*, *A. C. A.*

ORNITHOLOGICAL NOTICES.

Common Crossbill—Flock seen, *J. W. Parrington*, October 12.

Fieldfare—(Turdus pilaris), seen October 31st, *J. W. Parrington*, November 7th, *J. B. Oakeley*.

Redwing—(Turdus iliacus), seen October 22nd, *J. W. Parrington* and *F. Blackburn*.

Reed Warbler—(Salicaria arundinacea), apparently gone September 11th, *J. W. Parrington*.

Kingfisher—(Alcedo ispida), seen August 19th, *T. E. Maclean*, September 1, *G. Lister*, November 10, *E. H. Carr*.

Swallow—(Hirundo rustica), seen October 19th, *A. P. Hockin*, October 30, *H. W. Hockin*, October 31st, *Rev. H. Bell*.

Martin—(Hirundo urbica), seen October 30th, *G. H. Dawson*, November 11, *F. J. H. Jenkinson*, November 12, *A. Herklots*.

Heron—(Ardea cinerea), one seen near Preshute, November 1, *G. H. Dawson*; two seen near Mildenhall, November 10th, *E. H. Carr*.

Woodcock—(Scolopax rusticola), one seen in the Forest, November 3rd, — *Glasse*; one seen in Forest, December 4th, *W. D. Dowding*.

Snipe—(Scolopax gallinago), one seen near Mildenhall, September 10th, *Jenkinson*; one seen November 2nd, *W. D. Dowding*.

THE WEATHER.

July opened with cold wet weather, and lasted till the 7th—during this period rain fell almost all over England. From the 7th to the 12th, the temperature rose very considerably, but from that date to the end of September, it fell steadily. In July the night temperatures were high in general, so that the mean temperature of the month was not much below the average. The weather during the month was not unfavourable for the crops, though harvest operations did not begin anywhere till quite the end of the month, and only then in the extreme south districts of England.

August, as a whole, was a wet, cold month. The weather improved towards the end of the month, but for the first fortnight much rain fell, and the wind was very high. From the 15th, the days were very dull and close, with scarcely any wind, and about the 20th the weather was hot; but it soon gave way to damp, cold weather again, though the month terminated with two fine days.

The month of August may, therefore, be considered most unfavourable for agricultural pursuits; the absence of sunshine retarded the crops ripening; the frequent rain injured them, but to a less extent than was feared, in consequence of the heavy dry winds. In some places the crops were beaten down by the rain, and twisted by the wind, so that reaping machines could not be used. About Marlborough, harvesting began on the 4th.

September was a most unfavourable month for field-work. In some places rain fell every day, and though we had three days without rain, the enormous quantity of seven inches fell during the month. The wind was frequently excessively high, so that harvest-work was greatly interfered with, and much damage was done. A man was found dead on the downs from exhaustion;

and a grey Phalarope, a very rare visitor to this country, was shot by Mr. Coleman, of East Kennett, being probably driven so far in land by the stormy weather. The account of the crops was generally very unsatisfactory—much corn, especially oats and barley, was still out quite late in the month, but the root crops were favourable. The three first days of October were very wet, but, after that date, an improvement took place, and though, during the last fortnight of the month a considerable quantity of rain fell, the days were generally fine, and consequently harvest-work was finished by the middle of the month, and less damage was done than could have been expected. In 1865, October was a very wet month, and, in that respect, October, 1866, can contrast very favourably with it, but, not having had the high winds experienced last year, the air has been damper; the days, too, have frequently been very dull, and the sun has not been quite so powerful.

The first week of November was warm (so much as 11° warmer than in 1865), but the temperature fell gradually till on the 17th, a very cold period set in—this lasted only for four days, and the month ended with cold weather, but not colder than in 1865. On the 15th and 16th, the barometer fell very rapidly, but as rapidly regained its former level. High winds and rain occurred during that interval. The month, as a whole, was damp, and the weather rough.

The temperature of December rapidly increased for the first two days, and has continued much above the average. A considerable quantity of rain has, however, fallen, and fogs prevailed in the early part of the month. The height of the barometer has been very variable, whereas last year for the first fortnight it was remarkably high. Both in November and December, the minimum temperature at night has been very variable—in both months it was very cold from the 7th to the 13th.

	Mean height of Barometer.		Monthly range.		Mean temperature of air.		Mean daily range.		Maximum in shade.		Minimum in shade.		Maximum in sun.		Minimum on Grass.		Mean degree of Humidity		Mean amount of Cloud.		Amount of Rain.		No. of days on which it fell.	
	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865	1866	1865
	in	in	in	in	°	°	°	°	°	°	°	°	°	°	°	°					in	in		
JULY ……	29·483	29·500	0·976	0·652	59·4	62·0	18·2	22·2	83.2	82·1	40.3	41·4	139·8	145·1	31·2	34·2	76.1	87·4	6·8	6·8	1·574	2·561	12	16
AUGUST …	29·349	29·415	0·736	0·856	57·5	58.5	17·0	19·8	74.6	76·6	38·7	40·2	136.0	140·7	30·0	32·8	76.8	80·5	7·5	7.0	3·069	3·968	21	19
SEPT. ……	29·262	29·772	0·852	0·562	54·1	61·7	12·3	24·1	70·7	82·5	37·1	35·2	119·3	141·0	27·0	29·5	90.4	77·0	8·3	5·0	7·068	0·188	29	3
OCTOBER	29·625	29·139	0·810	1·218	51.0	50·4	11·8	17·5	67·6	72.6	30·2	31·0	119·0	117·2	24·0	23.7	89.0	82·7	7·9	6·6	1·793	7·311	16	23
NOVEMBER	29·498	29·400	1·022	1·522	44·0	43·5	13·6	16·0	57·9	65·5	25·6	24·4	97·8	89.0	18·8	19.2	87.2	88·0	7·1	7·0	3·102	3·893	18	20
DECEMBER	29·482	29·729	1·210	1·582	42·6	42·0	11·6	10·5	56·3	56.6	23·1	24·3	76·0	76·1	20·0	18·4	90.4	92·0	7·6	8·3	3·312	2·463	23	15
MEAN……	29·448	29·493	0·934	1.065	51·4	53·0	14·1	18·4	…	…	…	…	…	…	…	…	85·0	84·6	7.5	6·8	…	…	…	…

Total amount of rain during the six months in 1866—19·918 inches; in 1865, 20·384 inches.

Total amount of rain during the year 1866—38·052 inches; in 1865, 34·229 inches.

LIST OF LIBRARY.

No. of Vols.	Name of Book.	Donor.
5.	Intellectual Observer (1862-1866)	The Rev. J. M. Fuller.
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3.	The Entomologist	,,
2.	The Entomologist's Monthly Magazine ...	,,
2.	The Ibis	,,
6.	The Geological Magazine	The Rev. T. Cornthwaite.
1.	Ootheca Woolleiana (Part 1)	Professor Newton.
1.	Memoir of J. Woolley	,,
1.	Cassell's Birds	A. Herklots.
3.	Synopsis Floræ Helveticæ	Rev. H. Baber.
1.	Flora Germanica	,,
1.	British Algæ	Mrs. Gray.
1.	Wood's Index Entomologicus	Purchased out of Society's Funds.
1.	Handbook of Geological Terms (Page) ...	,,
2.	Hewitson's Eggs	,,
23.	The Zoologist	,,
1.	Sowerby's Wild Flowers	,,

REPORTS.

Midsummer, 1865.

No. in hand	5	Sold	2
		Given away	2
		In hand	1
	5		5

Christmas, 1865.

No. in hand	145	Sold	16
		Given away	2
		In hand	127
	145		145

Midsummer, 1866.

No. printed	400	Supplied to Members	31
		Sold	238
		Given away	18
		In hand	113
	400		400

ACCOUNTS.

Received.	£	s.	d.	Spent.	£	s.	d.
Balance from June, 1866	14	3	0	Entomological Cabinet	20	0	0
Subscriptions from Members	4	14	6	Lights	0	9	0
Donations	12	18	0	Books for Library	9	6	0
Sale of 1st "Report"	0	2	0	Stationery, &c.	0	8	9
Sale of 2nd "Report"	0	16	0	In hand	20	6	9
Sale of 3rd "Report"	17	17	0				
	£50	10	6		£50	10	6

LIST OF DONATIONS.

	£	s.	d.
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	£12	18	0

[illegible]	Saw-wort, full flower Aug. 22.
[illegible]	Woolly-headed Thistle, Pewsey-road, near Tan-cons lane, full flower Aug. 24, J.J.P.
[illegible]	Autumnal Hawkbit, nearly over Oct. 26.
[illegible]	Goat's-beard, Forest-hill, Sep. 1.
[illegible]	Dandelion, flower as late as Nov. 11, *T. E. M. & H.A.J.*
[illegible]	Sow-thistle, Preshute, Sep. 8.
[illegible]	Sow-thistle, as late as Nov. 11, *A.M.*
[illegible]	Corn Sow-thistle, plentiful on the railway banks, and at Avebury.
[illegible]	Smooth Hawk's-beard, flower as late as Oct. 26.
[illegible]	Wood Hawkweed, Manton Copse.
[illegible]	Shrubby Hawkweed, Martinsell, Aug. 30. *T.E.M.*
[illegible]	Avebury, nearly over Aug. 23.
[illegible]	Clustered Bell-flower, flower as late as Nov. 5.
[illegible]	Nettle-leaved Bell-flower, Forest-hill, Sep. 1.
[illegible]	Ling, full flower Aug. 18, *T.E.M.*, occurs at Row Down, *T.E.M.*, Martinsell, *R.R.P.H.*, and at Avebury.
[illegible]	Ash, almost entirely leafless Nov. 10.
[illegible]	Lime, mostly leafless, Nov. 10.
[illegible]	Centaury, generally over by Sep. 11, flower as late as Oct. 24, *J.W.P.*
[illegible]	Felwort, in perfection during September; over by Nov. 5; white varieties found by G.F.R., H.M.H., and R.R.P.H.
[illegible]	Field Gentian, plentiful at Clench; Marlborough Common, H.R.A.—during September.
[illegible]	Comfrey, in flower during September; flower as late as Nov. 4, T.E.M. and *H.A.J.*
[illegible]	Mullein, flower as late as Oct. 21, *E. in T.*; a specimen 6½ feet high, Sept. 21, *R.R.P.H.*
[illegible]	Yellow Toad-flax, full flower during August. A specimen, approaching the Monstrosity, called Peloria, found on Forest Hill Sept. 1, by *R.R.P.H.*
[illegible]	Water Betony, flower as late as Nov. 27, *G.F.R.*
[illegible]	Cow-wheat, in perfection during August.
[illegible]	Red Rattle, flower as late as Sept. 24, *A.P.H.*

phrasia officinalis	Eye-bright. [illegible]
ronica chamædrys	Germander Speedwell. flower [illegible] and [illegible]
serpyllifolia	Thyme-leaved Speedwell. flower [illegible]
entha rotundifolia	Round-leaved Mint. [illegible]
copus europeus	Gipsy-wort. [illegible]
amintha Clinopodium	Wild Basil. [illegible]
nella vulgaris	Self-heal. [illegible]
eta Glechoma	Ground Ivy. flower [illegible]
ium purpureum	Red Dead-nettle. flower [illegible]
lbum	White Dead-nettle. flower [illegible]
hys sylvatica	Hedge Woundwort. [illegible]
ena officinalis	Vervain, Medicinal. [illegible]
ula vulgaris	Primrose, [illegible]
achia Nummularia	Moneywort. flower [illegible]
allis arvensis	Scarlet Pimpernel. flower [illegible]
onum Persicaria	Spotted Persicaria. [illegible]
us	[illegible]
us suberosa	Common Elm. [illegible]
ontana	Wych Elm. [illegible]
lus nigra	Black Poplar. [illegible]
naria viridis	Frog Orchis. [illegible]
ANTHES AUTUMNALIS	Lady's Tresses. [illegible]
m vineale	Crow Garlick, [illegible]
icum autumnale	Meadow Saffron, flower August [illegible]
us effusus	Soft Rush. [illegible]
NGLOMERATUS	[illegible]
nprocarpus	Jointed Rush. [illegible]
fonius	Toad Rush. [illegible]
a Plantago	Water Plantain, [illegible]